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Desmids from Thailand and Malaysia

MINORU HIRANO

ABSTRACT To increase our level of knowledge on a desmid flora of Southeast Asia, the present paper reports 663 taxa of 27 genera on the basis of collections from Thailand and Malaysia. The collections include 16 new taxa (i.e., eight new species, seven new varieties and one new form), and 99 “tropical” taxa. A few noticeable taxa and specimens are also discussed in terms of geography, taxonomy and morphology.

KEY WORDS Desmid/ Flora/ Malaysia/ Thailand

Introduction

The first knowledge on the desmid flora of Thailand was given by W. & G. S. West (1901) based upon the material from Koh Chang, a small island on the Gulf of Siam. Since then I have published two papers on the desmid flora of this geographical area based upon the material collected by Dr. Gentaro Imadaté (now Tokyo Medical and Dental University), a former member of the “Joint Thai-Japanese Biological Expedition to Southeast Asia 1961–62” (Hirano, 1967), and by Dr. Motoharu Okamura, A former member of the “Kochi University Expedition 1970” (Hirano, 1975). The samples of the latter were collected from Lake Boraphet (Bung Boraphet) in the central plain of Thailand.

The desmid flora of the adjacent areas were also published by several algologists: Sumatra, Java and Bali in Indonesia (Krieger, 1932); South Borneo (Kalimantan), Sumatra and Java in Indonesia (Scott & Prescott, 1961); Cambodia (Hirano, 1972). The samples from Cambodia were collected by Dr. Masao Ohno in 1969 (the “Kochi Univ. Exped. 1969”).

Those last several years, I have examined the algal samples from Thailand and the Malay Peninsula (including a few samples from Malaysia) hold in my possession. The sources are as follows:

1) Dr. Kitagawa’s collection from Thailand (9 stations; see List of stations in 1965–66).

These samples were collected by Dr. Naofumi Kitagawa, of Nara University of Education, Nara, who was a member of the “Kyoto University Biological Expedition to Thailand and Malaysia in 1965–66”. The desmid species I have detected from this collection are rather limited.

2) Hirano’s collection from Thailand and Malaysia (45 stations; see List of stations in 1967).

These samples were collected by myself when I was a member of the “Kyoto University Biological Expedition to Thailand and Malaysia in 1967”, which was conducted by a guidance of the Royal Forest Department of Thailand. The stations surveyed covered both mainland and the Malay Peninsula of Thailand and a part of Malaysia.

A total of 663 taxa of desmids have been identified in my samples examined of Thailand Malaysia. Among them 318 taxa should be added to the previous knowledge of the desmid

flora reported from this geographical area. New species, varieties and forms which will be described in the present paper are as follows:

Pleurotaenium annuloides sp. nov., *Pl. ehrenbergii* f. *distinctum* f. nov., *Pl. trabecula* var. *thailandicum* var. nov., *Tetmemorus brebissonii* var. *ansatiformis* var. nov., *Cosmarium amoeboides* sp. nov., *C. ellipticum* sp. nov., *C. thailandicum* sp. nov., *Euastrum ansatum* var. *undulatum* var. nov., *E. bilobum* var. *thailandicum* var. nov., *E. exile* var. *latum* var. nov., *E. intermedium* var. *rotundatum* var. nov., *Micrasterias radians* var. *siamense* var. nov., *M. rotata* var. *curvata* var. nov., *Arthrodesmus thailandicus* sp. nov., *Xanthidium multispinum* sp. nov., *Staurostrum archeri* var. *curvatum* var. nov., *St. praeonii* var. *major* var. nov., *St. pachyrhynchiforme* sp. nov.

Krieger (1932) reported 23 genera and 380 species of desmids from Indonesia. Scott & Prescott (1961) also reported 24 genera and 525 species from Indonesia including South Borneo. My present paper (Hirano, 1990) contains 27 genera and 663 species from Thailand and Malaysia. A comparison of the number of desmid species reported from these two geographical areas in Southwest Asia seems to be interesting (see Table 1). From the data of the three papers mentioned above, it is clear that not a few genera and species are distributed both in Indonesia and Thailand (and Malaysia). Judging from my latest data which will be reported in the present paper (Hirano, 1990), 25 genera and more than 189 species are considered to be distributed both in these two geographical areas (about 93% of genera and over 35% of species known from these areas).

Krieger (1932) proposed the presence of the characteristic desmid flora in the tropical zone of Southeast Asia and Australia, *i. e.*, the "Indo-Malayan & Northern-Australian area". The northern demarcation line of the area may attain to Thailand and the Malay Peninsula; its southern demarcation line seems to be the northern Australia. The following 99 taxa detected in my samples from Thailand and Malaysia are tropical species according to Krieger's (op. cit.) classification mentioned above. They are as follows:

Pleurotaenium granuliferum, *Ichthyercus longispinus*, *I. angolense*, *Cosmarium cuneatum*, *C. javanicum*, *C. askenasyi* var. *latum*, *C. bengalense*, *C. otus* var. *ornatum*, *C. perpastum*, *Euastrum didelta* var. *bengalicum*, *E. exile*, *E. e.* var. *latum* var. nov., *E. serratum*, *E. horikawae*, *E. indicum* var. *capitatum*, *E. longicolle* var. *capitatum*, *Micrasterias anomala*, *M. cunningtoni*, *M. rotata* var. *curvata* var. nov., *M. lux*, *M. suboblunga* var. *tecta*, *M. moebii* var. *burmense*, *Xanthidium burkillii* var. *alternans*, *X. spinosum*, *X. sexmamillatum* var. *pulneyense*, *X. multispinosum* sp. nov., *Arthrodesmus spiculatus*, *A. convergens* var. *curtus*, *A. curvatus* var. *borgei*, *A. c.* var. *kalimantanus*, *A. c.* var. *latus*, *A. gibberulus*, *A. suchlanii*, *A. sumatranus*, *Staurostrum asterias*, *St. gibbum*, *St. burkillii*, *St. calyxoides* var. *orientale*, *St. cerastes* var. *coronatum*, *St. c.* var. *pulchrum*, *St. ceylanicum*, *St. clepsydra* var. *obtusum*, *St. columbetoides*, *St. contectum*, *St. corniculatum* var. *variabile*, *St. leptopus* var. *variabile*, *St. leptodermum* var. *ikapoeae*, *St. indentatum* var. *minus*, *St. inconspicuum* var. *crassum*, *St. javanicum* var. *apiculiferum*, *St. horametrum*, *St. hexacerum* f. *pentagona*, *St. heimerianum* var. *sumatranum*, *St. gracile* var. *ornatum*, *St. g. f. kriegei*, *St. g.* var. *elongatum*, *St. freemanii* var. *triquetrum*, *St. f.* var. *nudiceps*, *St. ensiferum*, *St. dentatum*, *St. pygmaeum* var. *obtusum*, *St. saltans* var. *polycerax*, *St. s.* var. *sumatratum*, *St. sebaldi* var. *ventriversucosum*, *St. sexangulare* var. *asperum*, *St. s.* var. *attenuatum*, *St. s.* var. *bidentatum*, *St.*

s. var. productum, *St. s. var. subglabrum*, *St. smithii*, *St. striolatum* var. *divergens*, *St. megacanthum* var. *orientale*, *St. modestum*, *St. perundulatum*, *St. pinnatum* var. *hydea*, *St. p. var. subpinnatum*, *St. p. var. robustum*, *St. praeii* var. *major* var. *nov.*, *St. protectum* var. *rangoonense*, *St. pseudozonatum* var. *sumatranum*, *St. punctulatum* var. *ellipticum*, *St. tauphorum*, *St. thienemanii* var. *calvum*, *St. t. var. triradiatum*, *St. tohopekaligense* f. *minus*, *St. t. var. insigne*, *St. tripyrenoideum*, *St. trissacanthum*, *St. unguiferum* var. *inermis*, *St. wildemanii* var. *majus*, *St. xanthium*, *St. zahlbrucknei* var. *mamillatum*, *St. zonatum* var. *ceylanicum*, *St. z. var. majus*, *Spondylosium javanicum*, *Sp. nitens* var. *triangulare*, *Desminium aptogonum* var. *tetragonum*, *D. suboccidentale*.

Judging from the data of the previous reports by algologists, the following species detected in my samples from Thailand and Malaysia are noticeable.

Table 1. Comparison of the number of desmid taxa reported from Indonesia (Krieger, 1932; Scott & Prescott, 1961) and Thailand and Malaysia (Hirano, 1990).

Areas Genera	Indonesia - I Krieger, 1932	Indonesia - II Scott & Prescott, 1961	Thailand & Malaysia Hirano, 1990
<i>Mesotaenium</i>	2	0	4 (2) [0]
<i>Cylindrocystis</i>	1	2	3 (1) [1]
<i>Spirotaenia</i>	0	1	1 (0) [0]
<i>Netrium</i>	2	2	4 (2) [2]
<i>Gonatozygon</i>	4	3	3 (1) [1]
<i>Penium</i>	6	3	4 (1) [1]
<i>Closterium</i>	41	40	59 (13) [18]
<i>Pleurotaenium</i>	21	33	41 (7) [9]
<i>Docidium</i>	1	1	1 (1) [1]
<i>Triploceras</i>	1	2	1 (1) [1]
<i>Ichthyocercus</i>	1	1	2 (1) [1]
<i>Actinotaenium</i>	0	6	22 (0) [6]
<i>Tetmemorus</i>	2	2	7 (2) [1]
<i>Euastrum</i>	30	61	63 (11) [17]
<i>Micrasterias</i>	15	37	38 (2) [8]
<i>Cosmarium</i>	119	111	207 (29) [38]
<i>Xanthidium</i>	4	23	18 (2) [9]
<i>Arthrodesmus</i>	7	23	19 (2) [11]
<i>Staurostrum</i>	105	145	140 (27) [57]
<i>Hyalotheca</i>	6	4	5 (2) [2]
<i>Haplozyga</i>	0	0	1 (0) [0]
<i>Spondylosium</i>	2	4	3 (2) [1]
<i>Onychonema</i>	1	4	2 (0) [0]
<i>Teilingia</i>	0	0	2 (0) [0]
<i>Desmidium</i>	4	11	8 (3) [2]
<i>Bambucina</i>	2	3	2 (0) [2]
<i>Groenbladia</i>	3	3	2 (0) [0]
Total	380	525	663 (112) [189]

Numbers in parentheses indicate the number of the same taxon reported by both Krieger (1932) and Hirano (1990). Numbers in brackets indicate the number of the same taxon reported by both Scott & Prescott (1961) and Hirano (1990).

1) *Haplozyga armata* var. *raciborskii* reported by Förster & Eckert (1966) from Brazil was found in the Phu Kradung samples (1965–66 and 1967 collections).

2) The similar form of *Ichthyocercus angolensis*, the taxon originally reported by West (1897) from Africa, was found in my samples from Thailand. *I. angolensis* has the semicell with a short apical spine; lateral margins of the semicell almost straight and not convex; slightly concave at the upper part of lateral margins. The similar form of *Ichthyocercus longispinus* was also found in the same locality in Thailand. Moreover, some specimens show an intermediate form between *I. angolensis* and *I. longispinus*. Some of the specimens which I identified as *I. longispinus* include the shorter and elongated forms. The typical form of *I. longispinus* is characterized by having an elongated semicell, a longer spine, slightly tumid at the basal part of the semicell. In the typical form of *I. angolense*, the semicell is shorter than that of *I. longispinus*, having a short spine and non-concave lateral margins.

3) *Xanthidium multispinosum* sp. nov. from Thailand is similar to *X. freemanii* var. *spinossissimum* reported by Islam (1970) from Dacca, Pakistan. However, the new species is distinguished from the latter by the different form of the semicell.

4) Among the *Micrasterias* species from Thailand, are some which have a curious form of the semicell divided into two small pieces toward its central direction. Although the similar phenomenon was already reported in *M. doveri* var. *africana* by many authors, no report has been found in any of other *Micrasterias* species. The form showing the similar variation which I have found in my samples of *Micrasterias rotata* from Thailand will be described in the present paper as *M. rotata* var. *curvata* var. nov.

List of stations (1965–66)

Thailand:

1. Phu Kradung. 28–29/XI, 1965.
2. Phu Luang. 1/XII, 1965.
3. Phanuk. 1/XII, 1965.
4. Doi Internon, lower. 18/XII, 1965.
5. A marshy place located near the summit of Doi Internon. 19/XII, 1965.
6. Doi Step. 31/XII, 1965.
7. Doi Chendao. 6/I, 1966.
8. Khao Chong. 29/I, 1966.
9. Khao Luang. 2/II, 1966.

List of stations (1967)¹⁾

Malaysia:

10. Kuala Lumpur. 5/VIII, 1967.
11. Sungai Gombak. 6/VIII, 1967.

Thailand:

12. West of Ranong. 9/VIII, 1967.
13. A pond of the Forest Department at Bangkok. 16/VIII, 1967.
14. Huai Sai. 18/VIII, 1967.
15. A rice-field at Tung Gaya, Tung Maprao. 19/VIII, 1967.

1) Sungai: (the local dialect) river. Huai: (the local dialect) brook or brooklet found only in the rain season.

16. A pass located between Kelenplay and Crabi. 19/VIII, 1967.
17. A rice-field at Huay Yot. 20/VIII, 1967.
18. A seaboard lake at Phuket. 20/VIII, 1967.
19. A lake of Phuket Island. 20/VIII, 1967.
20. A pond at Trang. 21/VIII, 1967.
21. Khao Chong. 21/VIII, 1967.
22. A small waterway along a road from Hat Yai to Songkhla. 22/VIII, 1967.
23. A seaboard pool at Songkhla. 22/VIII, 1967.
24. A small waterway along a road from Huay to Rattophum. 23/VIII, 1967.
25. A small waterway along a road from Satum to Huay Khaew. 23/VIII, 1967.
26. Ban Nai, Yuan, approximately 40 km NW of Krabi. 24/VIII, 1967.
27. Ranong. 25/VIII, 1967.
28. From Takuapa to Ranong. 25/VIII, 1967.
29. Near Takuapa (the name of the locality is uncertain). 27/VIII, 1967.
30. A pond at Khao Yai. 30/VIII, 1967.
31. Another pond at Khao Yai. 30/VIII, 1967.
32. A small waterway along a road from Saraburi to Wang Noi. 31/VIII, 1967.
33. A pond of the Botanical Garden, Saraburi. 31/VIII, 1967.
34. A stony place of the River Mauk Lek. 31/VIII, 1967.
35. Phu Kradung. 3–5/IX, 1967.
36. Phu Kradung (near a house). 3/IX, 1967.
37. A pool at Kradung (near a house). 3/IX, 1967.
38. Phu Kradung (near a house). 4/IX, 1967.
39. Anodat Pond at Phu Kradung. 4/IX, 1967.
40. Sra Kaed Pond at Phu Kradung. 4/IX, 1967.
41. A pond at Phu Kradung (near a house). 5/IX, 1967.
42. A pond of the Botanical Garden, Chiangmai. 8/IX, 1967.
43. Another small pond of the Botanical Garden, Chiangmai. 8/IX, 1967.
44. A pond located near the summit of Doi Step. 8/IX, 1967.
45. A notehr place of the same pond as the St. No. 44. 8/IX, 1967.
46. A small waterway at Chiangmai. 9/IX, 1967.
47. Non Boa Saket. 11/IX, 1967.
48. Non Boa Doi Saket. 11/IX, 1967.
49. Kong Loy, Chiangmai. 12/IX, 1967.
50. Kwan Phayao. 15/IX, 1967.
51. Wat Huai Sai Khao. 15/IX, 1967.
52. A river-side station at Chiengrai. 16/IX, 1967.
53. Chiengrai. 16/IX, 1967.
54. Tung Salaeng Luang National Garden. 23/IX, 1967.

The size of the cells is given in microns and the following abbreviations are used:

L = length; B = breadth; I = breadth of isthmus; Lssp = length without spine (sine spinibus); Lcsp = length with spine (cum spinibus); Lspr = length without process (sine processibus); Lcpr = length with process (cum processibus)

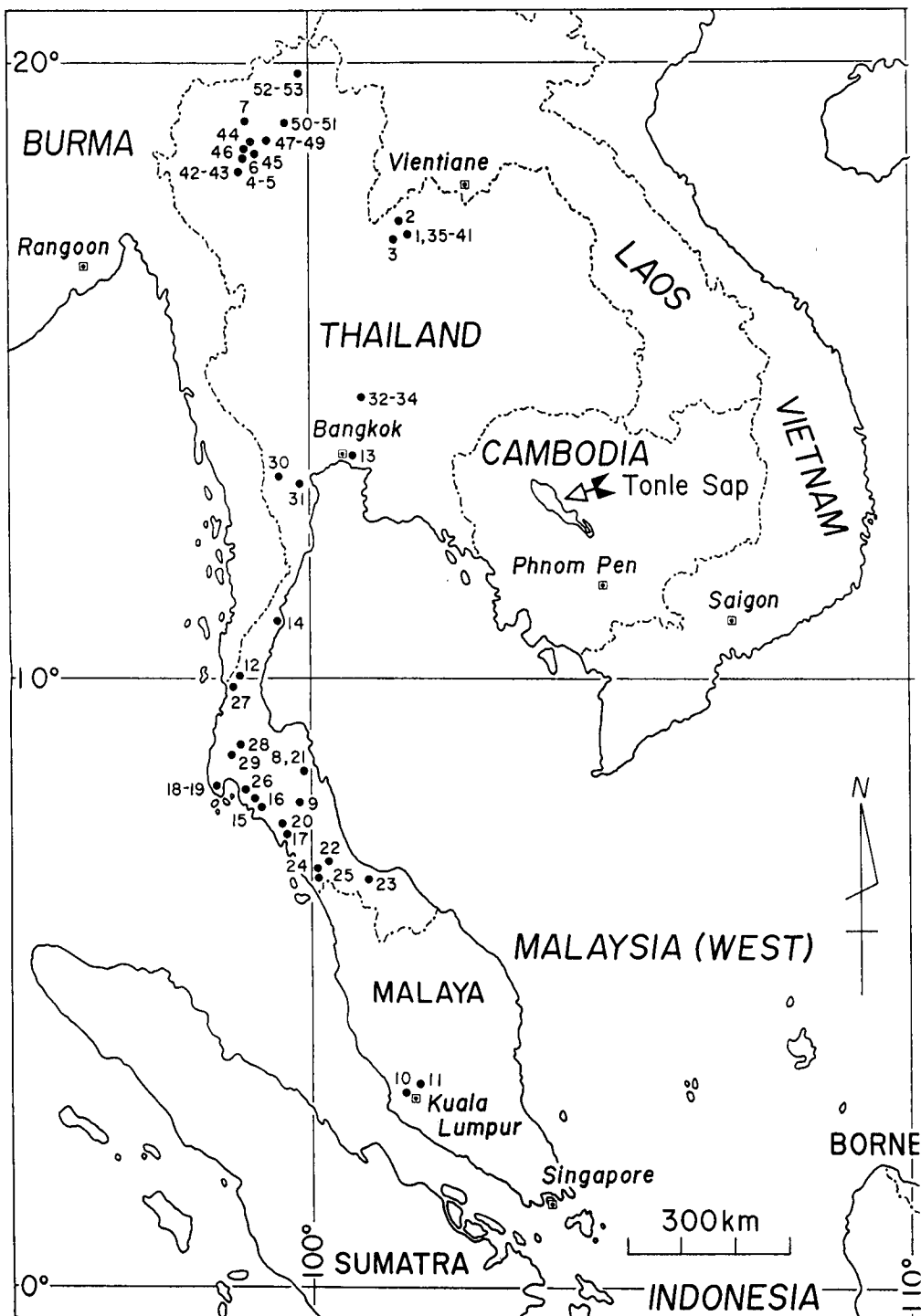


Fig. 1. Location of the sampling stations.

Fam. Mesotaeniaceae

1. *Mesotaenium degreyi* Turner Pl.4, f.6
West 1904, Brit. Desm. 1, 49, Pl.3, f.18,19; Krieger 1933, Krypt. Fl. 13:1, 191, Pl.3, f.1.
L. 84 μm , B.20 μm . St. 36. Japan, Europe, Australia. New to Thailand.
2. *M. endlicherianum* Näg. var. *endlicherianum* Pl.4, f.7.
West 1904, 56, Pl.4, f.20, 21; Krieger 1933, 193, Pl.3, f.5.
L. 26.5–35 μm , B.8–9 μm . St. 36. Indonesia (Java, Borneo), Europe, N. & S. America.
- 2a. var. *grande* Nordst.
Krieger 1933, 194, Pl.3, f.6,7; Prescott et al. 1972, 10, Pl.1, f.8,9.
L. 66 μm , B.11 μm . St. 41. Europe, U.S.A. New to Thailand.
3. *M. macrococcum* (Kütz.) Roy & Bisset Pl.1, f.8.
Krieger 1933, 198, Pl.4, f.1–3.
L. 26.5 μm , B. 15 μm . St. 30. Indonesia (Sumatra), Europe. New to Thailand.
1. *Cylindrocystis brebissonii* Menegh. var. *brebissonii* Pl.4, f.15.
West 1904, 58, Pl.4, f.23–32, Pl.5, f.10; Förster 1982, 32, Pl.1, f.1–4.
L. 40–48.5 μm , B.13–21 μm . Sts. 1,5,27,35,42. Cosmopolitan.
- 1a. var. *jenneri* (Ralfs) Hansg. Pl.5, f.5
Krieger 1933, 210, Pl.6, f.12,13.
L. 30 μm , B. 13 μm . St. 39. Europe, N.America.
- 1b. var. *turgida* Schmidle
Krieger 1933, 21, Pl.6, f.10.
L. 53 μm , B.26.5 μm . St. 18. Indonesia (Java), Europe, Africa, Australia. New to Thailand.
1. *Spirotaenia condensata* Bréb.
West 1904, 38, Pl.2, f.7–10; Förster 1982, 39, Pl.1, f.15–17.
L. 132 μm , B.15.5 μm . Sts. 24,25. Indonesia (Sumatra, Borneo), Japan, Europe, N.America.
1. *Netrium digitus* (Ehrenb.) Itigs. & Rothe var. *digitus*
West 1904, 64, Pl.6, f.14–16; Krieger 1933, 219, Pl.7, f.6.
L. 158–493 μm , B. 44–70 μm . Sts. 3,9,17,19,21,50,52,53. Cosmopolitan.
- 1a. var. *lamellosum* (Bréb.) Lütken.
Krieger 1932, 158, Pl.3, f.5; Förster 1982, 35, Pl.1, f.8.
L. 321–365 μm , B.66–68 μm . Sts. 17,19,23. Indonesia. Cosmopolitan.
- 1b. var. *naegelii* (Bréb.) Krieger
Krieger, 1933, 218, Pl.8, f.4,5.

L. 141–185 μm , B. 37.5–42 μm . Sts. 19,20,24. Cosmopolitan.

1c. var. *rhomboides* Grönblad

Grönblad 1920, Acta Soc. Fauna Flora Fenn. 47, 13, Pl.4, f.38.

L. 97–101 μm , B. 29.5 μm . St.18. Europe. New to Thailand.

Fam. Gonatozygaceae

1. *Gonatozygon aculeatum* Hast. Pl.1, f.1.
 Scott & Prescott 1961, Hydrobiol. 17, 8, Pl.1, f.7; Förster 1982, 43, Pl.2, f.1–4.
 L. 84–88 μm , B. 5–6.5 μm . Sts. 18,25,53. Indonesia (Sumatra, Borneo), New Zealand. New to Thailand.
2. *G. kinahanii* (Arch.) Rabenh. Pl.1, f.3,4.
 West 1904, 35, Pl.2, f.1–3; Förster 1982, 45, Pl.2, f.10.
 L. 202 μm , B. 9 μm . St.27. Europe, U.S.A., New Zealand. New to Thailand.
3. *G. monotaenium* DeBary Pl.1, f.2.
 Scott & Prescott 1961, 9, Pl.1, f.9; Förster 1982, 46, Pl.2, f.5–6.
 L. 140–378 μm , B. 11–13 μm . Sts. 13,21,24,25,33,36,42,44,47,53. Indonesia (Java, Sumatra), Ceylon, India, Europe, Africa, U.S.A., New to Thailand.

Fam. Desmidiaceae

1. *Penium margaritaceum* (Ehrenb.) Bréb. Pl.5, f.7.
 West 1904, 83, Pl.8, f.32–35; Krieger 1935, 230, Pl.10, f.2–4.
 L. 57–172 μm , B. 16–22 μm . Sts. 11,19,46. Cosmopolitan.
2. *P. polymorphum* Perty
 West 1904, 90, Pl.9, f.9–11; Krieger 1935, 229, Pl.11, f.18–20.
 L. 46.5–48.5 μm , B. 17.5–19 μm . Sts. 35,36,38,40. India, Indonesia (Java, Sumatra), Japan, Europe, Australia, New Zealand. New to Thailand.
3. *P. silvae-nigrae* Rabanus var. *parallelum* Krieger
 Krieger 1935, 240, Pl.11, f.5; Ruzicka 1977, 70, Pl.5, f.5–6.
 L. 46 μm , B. 20 μm . St. 2. Indonesia (Java), Japan, Europe. New to Thailand.
4. *P. spirostriolatum* Barker Pl.4, f.12.
 West 1904, 88, Pl.9, f.1–8; Krieger 1935, 227, Pl.9, f.1–6.
 L. 56–66 μm , B. 37 μm . St. 36. Indonesia (Java, Sumatra), India, Ceylon, Japan, Europe, Australia. New to Thailand.
1. *Closterium acerosum* (Schrank) Ehrenb. var. *acerosum* Pl.6, f.4.
 West 1904, 146, Pl.18, f.2–5; Krieger 1935, 314, Pl.23, f.11–12.
 L. 308–616 μm , B. 33–57 μm . St.19. Cosmopolitan. Cells slightly curved, non-tumid at the middle and almost straight, non-recurved at the end. Cell wall smooth and colourless but shows delicate striae in the older cell.

- 1a. var. *casinoense* Playfair Pl.7, f.1.
 Krieger 1935, 317, Pl.24, f.4.
 L. 550–768 μm , B. 48–56 μm . St. 13. Australia. New to Thailand.
- 1b. var. *elongatum* Bréb. Pl.2, f.3; Pl.6, f.5.
 Krieger 1935, 318, Pl.24, f.5; Förster 1982, 64, Pl.7, f.3.
 L. 626 μm , B. 36 μm . Sts. 23,24,26. India, Ceylon, Europe, N. & S.America, Australia. New to Thailand.
- 1c. var. *minus* Hantzsch
 Krieger 1935, 318, Pl.24, f.6.
 L. 251 μm , B. 28.5 μm . St. 18. India, Europe, N.America. New to Thailand.
2. *Cl. acutum* Bréb. var. *acutum* Pl.1, f.12.
 Krieger 1932, Arch. Hydrobiol. suppl.11, 159, Pl.3, f.11–12; Krieger 1935, 259, Pl.13, f.10–13.
 L. 79–92 μm , B. 4.5–5 μm . Sts. 32,39,49,51. Cosmopolitan. Cells non-tumid at the middle, slightly curved, and acute at the end.
- 2a. var. *variabile* (Lemm.) Krieger Pl.7, f.7.
 Krieger 1935, 262, Pl.13, f.18–22; Förster 1982, 66, Pl.4 f.6–9.
 L. 75 μm , B. 5.3 μm . St.10. Europe. New to Thailand.
3. *Cl. archerianum* Cleve Pl.2, f.8.
 West 1904, 115, Pl.11, f.8–10; Krieger 1935, 368, Pl.36, f.7–8.
 L. 198–267 μm , B. 24–26.5 μm . Sts. 22,25. Indonesia (Java), India, Europe, N. & S.America, Africa, Australia.
4. *Cl. baillyanum* (Bréb.) Bréb. Pl.3, f.2.
 Krieger 1935, 327, Pl.26, f.7–8; Förster 1982, 69, Pl.5, f.12.
 L. 304–343 μm , B. 31–35 μm . Sts. 19,49. Indonesia (Java, Borneo), Europe, N. & S.America, Africa.
5. *Cl. calosporum* Wittr. Pl.3, f.4.
 West 1904, 138, Pl.16, f.1–4; Krieger 1935, 292, Pl.19, f.1–3.
 L. 57–88 μm , B. 9–10 μm . Sts. 26,31,32,52. Thailand, India, Ceylon, Europe, N. & S.America, Africa, Australia.
6. *Cl. closterioides* (Ralfs) Louis & Peeters. var. *closterioides*
 Förster 1982, 71, Pl.3, f.10; Croasdale & Flint 1986, Flora New Zealand, 54, Pl.4, f.7,8.
 L. 125–163 μm , B. 24–31 μm . Sts.1,8,18,29,36,41,53. Cosmopolitan.
- 6a. var. *intermedium* (Roy & Bisset) Ruz.
 Ruzicka 1973, Preslia 45, 199, Pl.2, f.23; Ruzicka, 1977, 93, Pl.6, f.3–6; Förster 1982, 72, Pl.3, f.11–13.
 L. 112–165 μm , B. 22–27 μm . Sts.1,17,22,25,26,29,31,36,40,41,44,46,51,53. Cosmo-

politan.

7. *Cl. cornu* Ehrenb. Pl.3, f.13; Pl.7, f.3.
West 1904, 157, Pl.20, f.1–5; Krieger 1935, 269, Pl.15, f.5–9.
L. 127–130 μm , B. 8–9 μm . Sts. 17,52. Cosmopolitan.
8. *Cl. cynthia* DeNot. var. *cynthia*
West 1904, 113, Pl.11, f.1–3; Krieger 1935, 365, Pl.35, f.6–10.
L. 66–103 μm , B. 9–11 μm . Sts. 17,19,39. Cosmopolitan.
- 8a. var. *jenneri* (Ralfs) Krieger
Krieger 1935, 366, Pl.36, f.2.
L. 66–112 μm , B. 9–11 μm . Sts. 1,8,18. Cosmopolitan.
9. *Cl. diana*e Ehrenb. var. *diana*e Pl.2, f.7.
West 1904, 130, Pl.15, f.1–6; Krieger 1935, 294, Pl.19, f.9–11.
L. 264–290 μm , B. 22–35 μm . Sts. 2,14,20,25,33,36,43,44,51. Cosmopolitan.
- 9a. var. *arcuatum* (Bréb.) Rabenh. Pl.7, f.8.
West 1904, 131, Pl.15, f.21,22; Krieger 1935, 295, Pl.19, f.12.
L. 194 μm , B.13 μm . St.53. Cosmopolitan. New to Thailand.
- 9b. var. *minus* (Wille) Schröder
Krieger 1935, 296, Pl.19, f.15.
L. 110 μm , B. 13 μm . St. 53. Japan, Europe, Africa. New to Thailand.
10. *Cl. ehrenbergii* Menegh. var. *ehrenbergii* Pl.2, f.6.
West 1904, 143, Pl.17, f.1–4; Krieger 1935, 285, Pl.17, f.1, Pl.18, f.1.
L. 300–360 μm , B. 70–110 μm . Sts. 17,22,26. Cosmopolitan.
- 10a. var. *malinvernianum* (DeNot.) Rabenh. Pl.1, f.9; Pl.6, f.8.
Krieger 1935, 287, Pl.18, f.2; Föster 1982, 79, Pl.11, f.7.
L. 158 μm , B. 32 μm . Cells smaller than those of European forms. Sts. 22,30.
Europe, N. & S.America, Africa. New to Thailand.
11. *Cl. exiguum* W. & G.S.West
Ruzicka 1977, 100, Pl.7, f.21,22.
L.68 μm , B.4.5 μm . The specimens examined seem to be identical with *Cl. parvulum* Näg. var. *angustum* W. & G.S.West described in Krieger 1935, p.277, Pl.16, f.20,21. Cells strongly curved, non-tumid at the middle, gradually attenuated to the apex which is obtuse at the end; cell wall smooth and colourless. The specimens are also similar to *Cl. acutum* Bréb. var. *variabile* (Lemm.) Krieger. St. 13. Europe. New to Thailand.
12. *Cl. flaccidum* Delp. Pl.1, f.7.
Delponte 1877, Mem. R. Acad. Sci. Torino, II, 28, p.101, Pl.18, f.34–36; Prescott et al. 1975, 52, Pl.25, f.1.
L. 70–116 μm , B. 12–22 μm . Sts. 32,51. Europe. New to Thailand.

13. *Cl. gracile* Bréb. var. *gracile* Pl.1, f.13.
West 1904, 166, Pl.21, f.8–12; Krieger 1935, 310, 30, f.7–9.
L. 125–220 μm , B. 4.5–9 μm . Sts. 18,19,20,32,35,45,53. Cosmopolitan.
- 13a. var. *elongatum* W. & G.S.West Pl.9, f.7.
West 1904, 168, Pl.21, f.14–16; Krieger 1935, 310, Pl.30, f.7–9.
L. 334 μm , B. 6.5 μm . St. 44. Europe, N.America. New to Thailand.
- 13b. var. *tenue* (Lemm.) W. & G.S.West
West 1904, 168, Pl.21, f.13; Krieger 1935, 312, Pl.30, f.12.
L. 84 μm , B. 4.5 μm . St.47. Ceylon, Europe, N.America, Africa. New to Thailand.
14. *Cl. idiosporum* W. & G.S.West Pl.2, f.5.
West 1904, 180, Pl.23, f.20,21; Krieger 1935, 271, Pl.15, f.1,2.
L. 250–450 μm , B. 9–12 μm . Sts. 25,30,31. Europe, New Zealand. New to Thailand.
15. *Cl. infractum* Messik. Pl.1, f.15.
Krieger 1935, 259, Pl.14, f.5.
L. 23–28 μm , B. 9.5–10 μm . Sts. 28,30,32. Indonesia (Sumatra), Japan, Europe.
New to Thailand.
16. *Cl. intermedium* Ralfs Pl.1, f.11; Pl.4, f.11.
West 1904, 125, Pl.14, f.1–5; Krieger 1935, 335, Pl.28, f.5–6; Förster 1982, 81, Pl.6,
f.8–9.
L. 145–238 μm , B. 18.5–24 μm . Sts. 31,36. Cosmopolitan. New to Thailand.
17. *Cl. juncidum* Ralfs var. *elongatum* Roy & Bisset Pl.7, f.2.
Krieger 1935, 335, Pl.28, f.4.
L. 220–334 μm , B. 9–10 μm . Sts. 19,53. Indonesia (Java), Japan, Europe, N.America.
New to Thailand.
18. *Cl. kuetzingii* Bréb. Pl.2, f.4.
West 1904, 186, Pl.25, f.6–11; Krieger 1935, 351, Pl.32, f.8,9.
L. 352–506 μm , B. 15–22 μm . Sts. 14,25,26,32,43,44,47,49. Cosmopolitan.
19. *Cl. lanceolatum* Kütz. Pl.10, f.6.
West 1904, 149, Pl.17, f.9,10; Krieger 1935, 319, Pl.24, f.9,10
L. 348 μm , B. 44 μm . St. 23. Indonesia (Java).
20. *Cl. laterale* Nordst. Pl.3, f.7.
Krieger 1935, 351, Pl.32, f.7; Prescott et al. 1975, 59, Pl.30, f.12.
L. 576 μm , B. 31 μm . St. 25. Europe, N. & S.America. New to Thailand.
21. *Cl. leibleinii* Kütz. Pl.7, f.6.
West 1904, 141, Pl.16, f.9–14; Krieger 1935, 283, Pl.17, f.5–7.
L. 123–229 μm , B. 22–39 μm . Sts. 2,13,14,19,21, Cosmopolitan.

22. *Cl. lineatum* Ehrenb. Pl.11, f.7.
 West 1904, 181, Pl.24, f.1–5; Krieger 1935, 349, Pl.32, f.1–2.
 L. 601 μm , B. 33 μm . Cells slightly curved, approximately 18 times longer than the breadth, and the median part straight and parallel. St. 22. Cosmopolitan.
23. *Cl. littorale* Gay
 West 1904, 155, Pl.19, f.14; Krieger 1935, 298, Pl.20, f.3–5; Förster 1982, 88, Pl.10, f.13,14.
 L. 158 μm , B. 23 μm . St. 22. Japan, Europe, N.America.
24. *Cl. malinvernialiforme* Grönblad
 Krieger 1935, 282, Pl.17, f.2,3.
 L. 139 μm , B. 29 μm . The specimens examined are somewhat smaller than the European forms described by Krieger, and more broadly rounded at both ends. They are also similar to *Cl. ehrenbergii* var. *malinvernianum* (DeNot.) Rabenh. but smaller in size. St. 22. Europe, N. & S.America. New to Thailand.
25. *Cl. moniliferum* (Bory) Ehrenb. var. *moniliferum*
 West 1904, 142, Pl.16, f.15,16; Krieger 1935, 289, Pl.18, f.6,7.
 L. 198–484 μm , B. 40–70 μm , Sts. 8,9,11,34,44,48. Cosmopolitan.
- 25a. var. *concaum* Klebs Pl.1, f.10; Pl.6, f.1.
 Krieger 1935, 291, Pl.18, f.8; Prescott et al. 1975, 71, Pl.21, f.10.
 L. 207–277 μm , B. 41–44 μm . Sts. 4,17, Europe. New to Thailand.
26. *Cl. navicula* (Bréb.) Lütkem.
 Krieger 1935, 257, Pl.12, f.8–10; Förster 1982, 92, Pl.3, f.14–16.
 L. 30–31 μm , B. 9–9.5 μm . Sts. 17,22,31,45,47. Cosmopolitan.
27. *Cl. nematodes* Joshua Pl.7, f.4,5.
 Joshua 1886, 370, Pl.37, f.1,2; Krieger 1935, 370, Pl.37, f.1,2; Förster 1982, 93, Pl.10, f.5.
 L. 220–242 μm , B. 24–27 μm . Sts. 11,18,19,49. India, Ceylon, Burma, Indonesia (Java), Japan, Africa, New Zealand.
28. *Cl. parvulum* Näg. var. *parvulum* Pl.1, f.5.
 West 1904, 133, Pl.15, f.9–12; Krieger 1935, 275, Pl.16, f.14–17; Förster 1982, 95, Pl.8, f.15–17.
 L. 97–145 μm , B. 12–15.5 μm . Sts. 2,18,21,22,30,31,32,36,43,44,45,47,50. Cosmopolitan.
- 28a. var. *angustum* W. & G.S.West Pl.1, f.6; Pl.3, f.10.
 West 1904, 134, Pl.15, f.13,14; Krieger 1935, 277, Pl.16, f.20,21.
 L. 62 μm , B. 5–6 μm . Sts. 20,26. Cosmopolitan. New to thailand.
29. *Cl. pritchardianum* Archer Pl.6, f.3.
 West 1904, 172, Pl.22, f.6–14; Krieger 1935, 321, Pl.25, f.1–4; Förster 1982, 98, Pl.7,

f.10–12.

L. 312 μm , B. 33 μm . Cells slightly curved, approximately 9.5 times longer than the breadth, inner margin concave, and both ends recurved. *Cl. acerosum* var. *elongatum* is very similar to this species. The latter is different from *Cl. pritchardianum* in its smaller size. St. 19. Singapore, China, Europe, N. & S.America, Africa, Madagascar.

30. *Cl. pseudolunula* Borge Pl.6, f.2,7.
 Krieger 1935, 305, Pl.22, f.3; Ruzicka 1977, 148, Pl.16, f.7–15.
 L. 321–343 μm , B. 35–44 μm . Sts. 11,51. Indonesia (Sumatra), Europe, U.S.A., Africa, Australia.
31. *Cl. pseudopusillum* Messik. Pl.4, f.5.
 Ruzicka 1977, 116, Pl.10, f.29–34.
 L. 48.5 μm , B. 12.5 μm . St. 35. Europe. New to Thailand.
32. *Cl. pusillum* Hantzsch var. *majus* Racib. Pl.3, f.11; Pl.4, f.8; Pl.6, f.6; Pl.7, f.10.
 Krieger 1935, 280, Pl.14, f.7.
 L. 88–121 μm , B. 13–13.5 μm . Sts. 35,45,51. Europe, S.America. New to Thailand.
33. *Cl. ralfsii* Bréb. var. *gracilius* (Maskell) Krieger Pl.7, f.9.
 Krieger 1935, 346, Pl.31, f.6; Croasdale & Flint 1986, Flora New Zealand, Vol.1, 67, Pl.10, f.9.
 L. 238 μm , B. 15.5 μm . St. 37. Burma, Europe, Australia, New Zealand. New to Thailand.
- 33a. var. *hybridum* Rabenh. Pl.2, f.1; Pl.4, f.4
 West 1904, 183, Pl.24, f.8–13; Krieger 1935, 347, Pl.31, f.4,5.
 L. 405 μm , B. 31–37.5 μm . Sts. 18,44,47. Cosmopolitan.
34. *Cl. rostratum* Ehrenb. Pl.4, f.10.
 West 1904, 188, Pl.26, f.1–5; Krieger 1935, 354, Pl.33, f.1–3.
 L. 317 μm , B. 23 μm . St. 41. Cosmopolitan. New to Thailand.
35. *Cl. setaceum* Ehrenb.
 West 1904, 190, Pl.26, f.9–13; Krieger 1935, 356, Pl.33, f.8–10.
 L. 200–300 μm , B. 8.5–10 μm . Sts. 1,19,20,25,36,40,51. Cosmopolitan.
36. *Cl. striolatum* Ehrenb. var. *striolatum* Pl.3, f.6.
 West 1904, 122, Pl.13, f.7–16; Krieger 1935, 337, Pl.28, f.8,9.
 L. 176–220 μm , B. 26–31 μm . Sts. 25,36,47. Cosmopolitan.
- 36a. var. *borgei* (Borge) Krieger Pl.3, f.5,9.
 Krieger 1935, 339, Pl.28, f.11.
 L. 150–163 μm , B. 22 μm . Sts. 27,30. Europe, N.America.
- 36b. var. *rectum* W.West Pl.3, f.12.
 Krieger 1935, 340, Pl.28, f.13.
 L. 172–387 μm , B. 33–44 μm . St. 49. Europe, Africa. New to Thailand.

- 36c. var. *subdirectum* (W. West) Krieger Pl. 3, f. 3.
 Krieger 1935, 340, Pl. 28, f. 10.
 L. 211–220 μm , B. 21–22 μm . St. 31. U.S.A. New to Thailand.
37. *Cl. subscoticum* Gutw. Pl. 4, f. 2.
 Krieger 1932, 333, Pl. 27, f. 10–12.
 L. 150 μm , B. 23 μm . Cells slightly curved, slightly attenuated toward the end, approximately 6–7 times longer than the breadth, apex truncately convex; cell wall puncto-striated, striae 3 in 10 μm . St. 36. Indonesia (Java), Europe. New to Thailand.
38. *Cl. toxon* West
 West 1904, 160, Pl. 20, f. 13, 14; Krieger 1935, 310, Pl. 23, f. 4, 5; Förster 1982, 106, Pl. 5, f. 5, 6.
 L. 167 μm , B. 8–9 μm . St. 1. Europe, N. & S. America. New to Thailand.
39. *Cl. tumidum* Johnson
 West 1904, 156, Pl. 19, f. 15–18; Krieger 1935, 267, Pl. 14, f. 10, 11; Förster 1982, 107, Pl. 10, f. 8.
 L. 121 μm , B. 13 μm . St. 18. Thailand, Japan, Europe, N. & S. America, Africa.
40. *Cl. ulna* Focke Pl. 3, f. 8; Pl. 4, f. 1, 3, 9.
 West 1904, 127, Pl. 14, f. 7–9; Krieger 1935, 341, Pl. 29, f. 1–4.
 L. 335–506 μm , B. 20–22 μm . Sts. 20, 26, 29, 35, 36, 39, 41, 49. India, Ceylon, Europe, U.S.A., Australia. New to Thailand.
41. *Cl. venus* Kütz. var. *venus* Pl. 2, f. 2.
 West 1904, 137, Pl. 15, f. 15–20; Krieger 1935, 272, Pl. 16, f. 1–5; Förster 1982, 110, Pl. 8, f. 10, 13–14.
 L. 48–57 μm , B. 8.5–9 μm . Sts. 25, 33, 52. Cosmopolitan.
- 41a. var. *incurvum* (Bréb.) Krieger
 Krieger 1935, 273, Pl. 16, f. 6, 7.
 L. 61–63 μm , B. 13 μm . St. 10. Cosmopolitan.
1. ***Pleurotaenium annuloides* Hirano, sp. nov.** Pl. 9, f. 4.
 Cellulae mediocres, circiter 12-plo longiores quam latae; semicellulae cum infratione basali, gradatim attenuatae ad apicem, apice truncato cum tuberculis rotundis 6–7 visibilibus, marginibus lateralibus paullo undulatis; membrana scrobiculato-punctata, cum annulo 13–14 evidente, annulis multis scrobiculatis composito, inter scrobiculos punctulis sparse distributis. Long. 290 μm , lat. 28.6 μm , apic. 17.6 μm . St. 12.
 Type: Pl. 9, f. 4. Loc. West of Ranong, Thailand.
 Cells medium sized, approximately 12 times longer than the breadth; semicells with a slight inflation at the base, gradually attenuated toward the apex, which is truncated and with a ring of rounded tubercles 6–7 visible, lateral margin slightly undulate, irregularly grouped and confined at the undulations, other parts coarsely punctated. L. 290 μm , B. 28.6 μm , apic 17.6 μm . St. 12.

2. *Pl. baculoides* (Roy & Bisset) Playfair Pl.5, f.12,13.
Krieger 1932, 404, Pl.41, f.4; Förster 1982, 115, Pl.13, f.8.
L. 510–530 μm , B. 13–14 μm . Semicells are not attenuated toward the end, with a distinct basal inflation and two slight subinflations on it. Sts. 20,32,49. India, Japan, Europe, Africa, Australia.
3. *Pl. caldense* Nordst. var. *cristatum* (Turner) Krieger
Krieger 1937, 425, Pl.46, f.2; Hirano 1967, Nature & Life SE. Asia 5, 41, Pl.13, f.6.
L. 470–718 μm , B. 26–35 μm , Apex 25.5–33 μm . St. 20. Thailand, India, Cuba, Australia.
4. *Pl. coroniferum* (Borge) Krieger
Krieger 1937, 422, Pl.45, f.9.
L. 233 μm , B. 21 μm , apex 19.5 μm . Cells of medium size, 11 times longer than the breadth, slightly attenuated toward the end, lateral margin undulated, apex truncate and with a series of conical granules. St. 52. Java, S.America. New to Thailand.
5. *Pl. cuyabense* Borge var. *inornatum* (W. & G.S.West) Bando
Bando 1988, J. Sci. Hiroshima Univ. Ser.B, Div.2, vol.22(1), 42, f.21,45. syn. *Pl. cuyabense* Borge f. *inornatum* W. & G.S. West 1907, Ann. R. Bot. Gard. Culcatta 6(2), 195, Pl.13, f.10.
L. 454 μm , B. 28.6 μm . Cells large, almost 16 times longer than the breadth, scarcely attenuated toward the apex, lateral margin loosely undulate, apex broadly rounded. St. 26. Burma, Japan. New to Thailand.
6. *Pl. cylindricum* (Turner) Schmidle var. *stuhlmanii* (Hieron.) Krieger Pl.8, f.1.
Krieger 1937, 420, Pl.45, f.3; Förster 1982, 117, Pl.17, f.8.
L. 651–1236 μm , B. 49–77 μm . The specimens examined are broader than the forms described by Krieger and Förster. They are not dilated near the end, lateral margin straight and non undulate. Sts. 14,21,22. S.America, Africa, Australia.
7. *Pl. ehrenbergii* (Bréb.) DeBary var. *ehrenbergii* Pl.10, f.1,2.
West 1904, Brit. Desm. 1, 205, Pl.29, f.9–11; Krieger 1937, 410, Pl.42, f.4–6.
L. 281–748 μm , B. 20–23 μm . Sts. 22,24,26,32,40,53. Cosmopolitan.
- 7a. var. *undulatum* Schaarschmidt Pl.10, f.3,4.
Krieger 1937, 415, Pl.43, f.2–4; Förster 1982, 119, Pl.14, f.5.
L. 145–400 μm , B. 20–25 μm . Semicells non attenuated to the apex, lateral margin with a basal inflation and beside this with two subundulations. Sts. 10,11,18,22,25,28,40. Cosmopolitan.
- 7b. **forma distinctum Hirano, f. nov.**
Semicellulae undulatae, non attenuatae ad apicem, marginibus lateralibus undulatis; membrana punctata cum seriebus scrobiculatis transversis distinctis inter undulas. Long. 277 μm , lat. 19.8 μm . St. 36.
Type Loc. Phu Kradung, Thailand.

Cells undulate, noN attenuated from base to apex, cell wall punctate with a distinct series of scrobiculations at the undulate point with a distinct series of scrobiculations at the undulate part. L. 277 μm , B. 19.8 μm . St. 36.

8. *Pl. elatum* (Turner) Borge
Krieger 1937, 425, Pl.46, f.3.
L. 668 μm , B. 55 μm . The number of lateral undulations is not coincided with the description of Krieger. St. 10. India, Ceylon, Indonesia (Java), Singapore, Africa. New to Thailand.
9. *Pl. excelsum* (Turner) Gutw. var. *excelsum* Pl.8, f.7.
Krieger 1937, 416, Pl.43, f.8,9.
L. 345–460 μm , B. 13–22 μm . Sts. 24,25,47. India, Ceylon, Indonesia (Java), Japan, U.S.A.
- 9a. var. *rhomphaeum* (Turner) Krieger
Krieger 1937, 416, Pl.43, f.8,9.
L. 374 μm , B. 13 μm . St. 24. India, Ceylon. New to Thailand.
10. *Pl. granuliferum* (Joshua) Hirano Pl.9, f.3.
Hirano 1977, Illustr. Freshwater Algae 517, Pl.175, f.8 (in Japanese), Bando 1988, J. Sci. Hiroshima Univ. Ser.B, Div.2, vol.22:1, 45, f.24,47. Syn. *Docidium granuliferum* Joshua 1886, Journ. Linn. Soc. Bot. 21, 650, Pl.25, f.11–12.
L. 680–885 μm , B. 45–60 μm . Cells large, 10–14 times longer than the breadth, not attenuated toward the end; semicells with a distinct basal inflation and non-attenuated toward the apex but slightly attenuated near the apex, lateral margin almost parallel and slight undulate from base to the middle part of semicell but not undulate near the apex. St. 10. Burma, Japan.
11. *Pl. indicum* (Grun.) Lund. Pl.5, f.14.
Krieger 1937, 403, Pl.41, f.8; Prescott et al. 1975, 119, Pl.41, f.9.
L. 370–540 μm , B. 26.5–31 μm . Undulations of the lateral margin extend from its base to the middle part; the upper half of the lateral margin is straight. St. 26. Cosmopolitan.
12. *Pl. kayei* (Arch.) Rabenh.
Krieger 1937, 440, Pl.51, f.8; Scott & Prescott 1961, Hydrobiol. 17,16, Pl.5, f.10,11.
L. 392 μm , B. 57 μm . St. 22. Indonesia (Java, Sumatra), India, Ceylon, Japan, Australia.
13. *Pl. maculatum* (Turner) Krieger
Krieger 1937, 426, Pl.46, f.4.
L. 686 μm , B. 40.5 μm . St. 44. Burma, India. New to Thailand.
14. *Pl. maximum* (Reinsch) Lund. Pl.8, f.3.
Ruzicka 1977, Desm. Mitteleuropa 1:1, 263, Pl.37, f.1–2.
L. 638–1035 μm , B. 47.5–53 μm . Sts. 4,22,43. Burma, Indonesia (Java, Sumatra),

Japan, Europe, N. & S.America. New to Thailand.

15. *Pl. minutum* (Ralfs) Delp. var. *minutum* Pl.7, f.11.
 Krieger 1937, 390, Pl.39, f.2,3; Förster 1982, 120, Pl.13, f.1–2; Croasdale & Flint 1986, Fl. New Zeal. Desm. Vol.1, 73, Pl.14, f.1.
 L. 136–202 μm , B. 10–13 μm . Sts. 1,24,29,30,36,40,41,49. Cosmopolitan.
- 15a. var. *attenuatum* Krieger (cf.) Pl.10, f.7.
 Krieger 1937, 392, Pl.39, f.5; Förster 1982, 121, Pl.13, f.6.
 L. 198 μm , B. 9 μm , St. 19. Brazil. New to Thailand.
- 15b. var. *crassum* (W.West) Krieger Pl.7, f.12.
 Krieger 1937, 392, Pl.39, f.6,7; Ruzicka 1977, 259, Pl.36, f.15–19.
 L. 53–84 μm , B. 14.5–15 μm . Sts. 3,27. Indonesia (Sumatra) Europe, N.America, Brazil, Africa. New to Thailand.
- 15c. var. *cylindricum* (Borge) Krieger Pl.7, f.13.
 Krieger 1937, 393, Pl.39, f.8; Prescott et al. 1975, 123, Pl.39, f.4,5.
 L. 198–207 μm , B. 9–13 μm . Sts. 30,35. U.S.A., Brazil. New to Thailand.
- 15d. var. *gracile* (Wille) Krieger Pl.9, f.6.
 Krieger 1937, 394, Pl.39, f.4; Prescott et al. 1975, 123, Pl.39, f.9–10.
 L. 224 μm , B. 9 μm . Ceylon, Indonesia (Sumatra), Europe, N.America, Brazil, Africa. New to Thailand.
- 15e. var. *latum* Kaiser Pl.9, f.5.
 Prescott et al. 1975, 124, Pl.39, f.15–16; Ruzicka 1977, 259, Pl.36, f.24–29.
 L. 251 μm , B. 26.5 μm . St. 10. Indonesia (Sumatra), Europe. New to Thailand.
- 15f. var. *rectissimum* (W. & G.S.West) Krieger
 Krieger 1937, 394, Pl.39, f.14.
 L. 356 μm , B. 21 μm . St. 41. Europe, N.America. New to Thailand.
16. *Pl. nodosum* (Bail.) Lund. var. *nodosum*
 West 1904, 214, Pl.31, f.3–6; Krieger 1937, 436, Pl.47, f.1; Förster 1982, 123, Pl.15, f.5.
 L. 418 μm , B. 77 μm , St. 36. Cosmopolitan.
- 16a. var. *gutwinskii* Krieger Pl.10, f.9.
 Krieger 1937, 437, Pl.47, f.2; Förster 1982, 24, Pl.15, f.6.
 L. 242–262 μm , B. 50–53 μm . Sts. 22,24,29. Ceylon, Indonesia (Java), S.America, Australia. New to Thailand.
17. *Pl. nodulosum* (Bréb.) DeBary Pl.8, f.4.
 Prescott et al., 1975, 2:1, 126, Pl.47, f.6,8–11.
 My specimen examined was a broken semicell only. The size of the specimen is uncertain, it seems to be small than that of European and American forms. Moreover 4 undulations of the lateral margin (including the basal inflation) decreased the number

near the apical part of semicell. Prescott et al. recorded 6–7 undulations. Ruzicka's figure shows the straight lateral margin without any undulation. Apex of a semicell shows a somewhat truncate and round shape. St. 26. Europe, N. & S.America. New to Thailand.

18. *Pl. ovatum* Nordst. var. *ovatum*

Krieger 1937, 434, Pl.50, f.1; Prescott et al. 2:1, 1975, 127, Pl.48, f.16; Croasdale & Flint 1986, 74, Pl.13, f.3,4.

L. 309 μm , B. 110 μm . St. 14. India (Bengal), Indonesia (Java), S. America, Australia, New Zealand, Africa.

18a. var. *inermius* Möbius

Scott & Prescott 1961, 17, Pl.6, f.3,4.

L. 295 μm , B. 106 μm . and I. 57 μm . St. 14, Japan, Formosa, S.America, Australia, Africa.

18b. var. *tumidum* (Maskell) G.S.West

Pl.11, f.4,5,6.

Krieger 1937, 435, Pl.50, f.2,3; Croasdale & Flint 1986, 74, Pl.13, f.5–8.

L. 277–282 μm , B. 88–90 μm . Sts. 22,24. India, Burma, Indonesia (Java), Africa, Australia, New Zealand. New to Thailand.

19. *Pl. raciborskii* (Racib.) Croasd.

Prescott et al. 1975, 128, Pl.42, f.1. Syn. *Pl. breve* Racib. in Krieger 409, Pl.44, f.2.

L. 48.5 μm , B. 15.8 μm . Semicells show the trace of apical spine but other semicell of the same individual destitute the spine. St. 37. British Guiana. New to Thailand.

20. *Pl. rectum* Delp.

Pl.5, f.10,11.

Ruzicka 1977, 260, Pl.37, f.3–8; Förster 1982, 124, Pl.13, f.15.

L. 145–409 μm , B. 17.5–22 μm . Cells approximately 13–26 times longer than the breadth, non attenuated from a basal inflation to the apex, and lateral margin almost straight except for the basal inflation. *Pl. trabecula* (Ehrenb.) Näg. var. *rectum* (Delp.) W. & G.S.West is conspecific with this species. Sts. 1,19,30,32,36,40,43,49, Cosmopolitan.

21. *Pl. subcoronulatum* (Turner) W.West

Pl.8, f.2.

Krieger 1937, 422, Pl.46, f.7; Förster 1982, 125, Pl.15, f.1–2.

L. 268–668 μm , B.33–40 μm . Sts. 25,26,32. India, Burma, Indonesia (Java), Japan, Africa, Madagascar, Australia, Brazil. New to Thailand.

22. *Pl. trabecula* (Ehrenb.) Näg. var. *trabecula*

Pl.5, f.8.

West 1904, 209, Pl.30, f.11–13; Krieger 1937, 395, Pl.40, f.1–4.

L. 396–520 μm , B. 22–35 μm . Sts. 2,18,19,25,30,44,45,47,49,51,53. Cosmopolitan.

22a. var. *crassum* Wittr.

Pl.5, f.9.

Krieger 1937, 399, Pl.40, f.6; Ruzicka 1977, 268, Pl.38, f.6–7.

L. 220–568 μm , B. 31–35 μm . Sts. 17,49. India, Japan, China, Europe, Greenland. New to Thailand.

- 22b. var. *rectissimum* W. & G.S.West
Krieger 1937, 401, Pl.41, f.1.
L. 543 μm , B. 22 μm . St. 36. Australia. New to Thailand.
- 22c. var. *thailandicum* Hirano, var. nov. Pl.9, f.2.
Semicellulae mediocres, circiter 16 plo longiores quam latae, cum apicibus truncato-convexis, marginibus lateralibus convexis, circiter attenuatis ad apicem, membrana cum granulis elongatis irregulariter dispositis. Long. 422 μm , lat. 26.4 μm , lat. apic. 26.4 μm . St. 12.
Type: Pl.9, f.2. Loc. West of Ranong, Thailand.
23. *Pl. trochiscum* W. & G.S.West Pl.11, f.3.
Krieger 1937, 437, Pl.51, f.2.
L. 466 μm , B. 44 μm . St. 31. Thailand, Burma, Ceylon, Indonesia (Java), N.America, Africa.
24. *Pl. verrucosum* (Bail.) Lund. var. *verrucosum*
Krieger 1937, 438, Pl.51, f.3; Hirano 1956, Contr. Biol. Lab. Kyoto Univ. 2, 69, Pl.15, f.1.
L. 282–317 μm , B. 22–24 μm . St. 1,35,36,39. India, Burma, Indonesia (Java), N.America, Brazil, Africa, Australia.
- 24a. var. *bulbosum* Krieger Pl.11, f.2.
Krieger 1937, 439, Pl.51, f.5; Prescott et al. 1975, 139, Pl.51, f.2,3.
L. 343–370 μm , B. 35–41 μm . St. 25. Indonesia (Sumatra), Canada. New to Thailand. Semicells slightly attenuated to the apex, with a distinct basal inflation, apex with acute tubercles, and lateral margin slightly convex.
- 24b. var. *coronatum* Krieger Pl.11, f.1.
Krieger 1937, 439, Pl.51, f.4.
230–378 μm , B. 26.5–44 μm . Semicells without any basal inflation, slightly attenuated from the base to the apex, apex with rounded tubercles, and lateral margin slightly convex, Sts. 17,22,24. Indonesia (Sumatra). New to Thailand.
1. *Docidium baculum* Bréb. Pl.4, f.3; Pl.5, f.6.
Krieger 1937, 379, Pl.38, f.1–7; Förster 1982, 129, Pl.15, f.9,10.
L. 143–255 μm , B. 11–14 μm . Sts. 1,20. Cosmopolitan.
1. *Triploceras gracile* Bailey Pl.10, f.10.
Krieger 1937, 442, Pl.52, f.1–7; Förster 1982, 131, Pl.16, f.1–3.
L. 420–484 μm , B. 18–30 μm , Sts. 20,22,32,49. Cosmopolitan.
1. *Ichthyocercus angolensis* W. & G.S.West Pl.8, f.8.
West 1897, Journ. Bot. 35, 80, Pl.368, f.26–35; Krieger 1937, 450, Pl.53, f.9–12.
L. 33–55 μm , B. 13–16 μm . Cells small, 2.5–2.6 times longer than the breadth, without spines, slightly constricted at the middle, sinus broadly open; semicells rectangular in shape, the basal part slightly inflated, lateral margin slightly convex or slightly re-

tuse above the inflated basal part, apex shallowly retused, apical angles with a short diverging spine; side view of semicell elongate-ovate. Sts. 39,41. W.Africa. New to Thailand.

2. *I. longispinus* (Borge) Krieger Pl.5, f.2–4.
 Krieger 1937, 450, Pl.53, f.13–15.
 L. 60–62 μm , B. 10–13 μm . Sts. 1,28,35,36,38,40,52. Indonesia (Sumatra), Japan, S.America. New to Thailand.

1. *Actinotaenium adelochondrum* (Elfv.) Teil. var. *kriegeri* (Messik.) Ruzicka Pl.12, f.1,3.
 Ruzicka 1981, 314, Pl.47, 12–14.
 L. 31 μm , B. 11 μm . St. 35. Europe.

2. *Act. australe* (Racib.) Croasdale Pl.12, f.11,13.
 Prescott et al. 1981, Synop. N.Amer. Desm. 2:3, 4, Pl.150, f.14,15.
 L. 66–85 μm , B. 35–57 μm . Sts. 17,18,28,44,49,50. Japan, Europe, N. & S.America, Africa, Australia.

3. *Act. capax* (Joshua) Teil. var. *minus* (Schmidle) Teil. Pl.12, f.10,14; Pl.13, f.2.
 Ruzicka 1981, 347, Pl.53, f.6; Prescott et al. 2:3,6, Pl.156, f.9.
 L. 73–80 μm , B. 41–51 μm . Sts. 36,44. Indonesia (Sumatra), Japan, Europe, N.America. New to Thailand.

4. *Act. clevei* (Lund.) Teil. Pl.12, f.2.
 Teiling 1954, Bot. Notis. 393, f.10,13; Prescott et al. 1981, 2:3,6, Pl.149, f.2,3; Förster 1982, 137, Pl.17, f.20.
 L. 73–79 μm , B. 20–23 μm . Sts. 10,31,51. Japan, Europe, N. & S.America.

5. *Act. crassiusculum* (DeBary) Teil. Pl.8, f.10.
 Ruzicka 1981, 333, Pl.43, f.20–28; Prescott et al. 1981, 2:3, 8, Pl.153, f.14–18.
 L. 48.5 μm , B. 18.5 μm . Sts. 1,3. Europe, N. et S. America, Africa.

6. *Act. cruciferum* (DeBary) Teiling
 Teiling 1954, Bot. Notis. 396, f.16,17; Prescott et al. 1981, 2:3, 8, Pl.150, f.1–4.
 L. 26.5–29.5 μm , B. 15.5–17 μm , I. 14–15 μm . Sts. 36,49. Europe, N. & S. America, New Zealand. New to Thailand.

7. *Act. cucurbita* (Bréb.) Teil. Pl.12, f.6; 15,16.
 Teiling 1954, 406, f.66; Ruzicka 1981, 328, Pl.50, f.1–19; Förster 1982, 139, Pl.17, f.8–13.
 L. 28–35 μm , B. 15–19 μm . Sts. 17,27,28,35,36,40. Cosmopolitan.

8. *Act. cucurbitinum* (Bisset) Teil. var. *cucurbitinum* Pl.10, f.8; Pl.12, f.7,8.
 Teiling 1954, 399, f.36; Ruzicka 1981, 318, Pl.48, f.1–14; Förster 1982, 140, Pl.17, f.6.
 L. 64–92 μm , B. 28–39 μm , I. 25.5–29 μm . Sts. 1,30,31,36,39,40,41,49,53. Japan, Europe, N. & S.America, Africa. New to Thailand.

- 8a. var. *minutum* (Prescott) Krieger & Gerloff

- Ruzicka 1981, 319; Prescott et al. 1981, 2:3, 12, Pl.151, f.6,7.
L. 30–39 μm , B. 22 μm , I.20.5 μm . St. 24. S.America. New to Thailand.
9. *Act. curtum* (Bréb.) Teil. Pl.11, f.8.
Teiling 1954, 390, f.1; Förster 1982, 141, Pl.17, f.7.
L. 30–39 μm , B. 17.5–24 μm , I.15 μm , Sts. 11,19,28. Europe, N. & S.America, Africa. New to Thailand.
10. *Act. diplosporium* (Lund.) Teil. var. *diplosporium* Pl.12, f.12.
Teiling 1954, 411, f.74; Ruzicka 1981, 354, Pl.55, f.1–10.
L. 59.5 μm , B. 31 μm . St. 20. Europe, N. & S.America, New Zealand.
- 10a. f. *majus* (West) Teil.
Prescott et al. 1981, 2:3, 16, Pl.155, f.5,6,9.
L. 102–108 μm , B. 46 μm . St. 25. Europe, N. & S.America. New to Thailand.
11. *Act. globosum* (Bulnh.) Förster Pl.17, f.4–5.
Förster 1982, 144, Pl.17, f.4–5.
L. 26.5–40 μm , B. 15–24 μm . Sts. 1,30,31,36,40,51. Japan, Europe, N. & S. America, Africa, Australia, New Zealand.
12. *Act. inconspicuum* (W. & G.S.West) Teil. Pl.12, f.4.
Teiling 1954, 403, f.57,58; Prescott et al. 1981, 2:3, 19, Pl.154, f.1–7.
L. 17.6 μm , B. 9 μm , Sts. 36,41. New Zealand.
13. *Act. obcuneatum* (W.West) Teil. var. *oravicum* Ruzicka Pl.12, f.18.
Ruzicka 1981, 321, Pl.47, f.19–26; Förster 1982, 142, Pl.17, f.16–18.
L.19–20 μm , B. 10 μm . Sts. 26,35,40. Europe. New to Thailand.
14. *Act. subglobosum* (Nordst.) Teil. Pl.9, f.9.
Teiling 1954, 397, f.33; Ruzicka 1981, 321, Pl.49, f.1–5; Prescott et al. 1981, 2:3, 22, Pl.150, f.16–18.
L. 31 μm , B. 17.5 μm . St. 24. Europe, N. & S.America, Africa, Asia. New to Thailand.
15. *Act. truncatum* (Bréb.) Teil. Pl.12, f.9.
Teiling 1954, 404, f.62,63; Ruzicka 1981, 334, Pl.49, f.14–19; Prescott et al. 1981, 23, Pl.153, f.19–29.
L. 31–52 μm , B. 13–14.5 μm , and I. 12–13 μm . Sts. 36,40. Asia, Europe, U.S.A. New to Thailand.
16. *Act. turgidum* (Bréb.) Teil. var. *turgidum* Pl.13, f.1.
Teiling 1954, Bot. Notis. 395, f.21; Ruzicka 1981, 349, Pl.54, f.1–9.
L. 167 μm , B. 70 μm , I. 48.5 μm . St. 47. Europe, Japan, Australia, New Zealand.
- 16a. f. *minus* Croasdale
Prescott et al. 1981, Synop. N.Amer. 2:3, 24, 156, f.4.
L. 88–98 μm , B. 41–42 μm , I.39–40 μm . Sts. 17,20,26. N.America. New to Thailand.

land.

- 16b. var. *ovatum* (Nordst.) Teil. Pl.13, f.3.
 Prescott et al. 1981, Synop. 2:3, 24, Pl.156, f.3.
 L. 176–211 μm , B. 75–84 μm , I. 37–40 μm . Sts. 17,18,19,21. Eurpe, Australia, New Zeland.
17. *Act. westii* (Bernard) Hirano, **comb. nov.**
 Syn. *Cosmarium turgidum* Bréb. var. *westii* (Bernard) Krieger
 L. 55 μm , B. 36.5 μm . St. 26. Java. New to Thailand.
18. *Act. wollei* (W. & G.S.West) Teil.
 Prescott et al. 1981, Synop. 2:3, 25, Pl.150, f.19–23.
 L. 31–32 μm , B. 23–24 μm . Sts. 20,36,49. Cosmopolitan.
1. *Tetmemorus brebissonii* (Menegh.) Ralfs var. *brebissonii*
 West 1904, 216, Pl.32, f.1,2; Krieger 1937, 452, Pl.54, f.1–5; Förster 1982, 299, Pl.39, f.10.
 L. 143–149 μm , B. 24–26.5 μm , and I. 22–23 μm . Sts. 3,23, India, Indonesia (Sumatra), Europe, U.S.A., Brazil, Australia, New Zealand.
- 1a. var. *ansatifformis* Hirano, **var. nov.** Pl.22, f.2.
 Cellulae mediocres, circiter 37 plo longiores quam latae, leviter constrictae ad medium, sinu aperto; semicellulae cum apice truncato-convexo cum incisura mediana profunda angusta, marginibus lateralibus leviter concavis; semicellulae in latere visae elongato-pyramidatae, apice truncato-recto, marginibus lateralibus paene rectis sed in basalibus leviter biundulatis; membrana cum interrupto-striae ordinata. Long. 145 μm , lat. 26.5 μm , lat. isthm. 23.5 μm . St. 2.
 Type: Pl.22, f.2. Loc. Phu Luang, Thailand.
2. *T. granulatus* (Bréb.) Ralfs var. *granulatus*
 West 1904, 219, Pl.32, f.7–9; Krieger 1937, 458, Pl.55, f.1–5; Förster 1982, 300, Pl.39, f.7–8.
 L. 123–139 μm , B. 26.5–30 μm , and I. 25 μm . Sts. 3,4,5. Cosmopolitan.
- 2a. var. *attenuatus* W. & G.S.West Pl.4, f.13,14; Pl.22, f.1.
 West 1904, 221, Pl.32, f.10; Krieger 1937, 459, Pl.55, f.6; Förster 1982, 301, Pl.39, f.9.
 L. 132 μm , B. 26–29 μm , and I. 25–28 μm . Sts. 1,38,39,40. Europe, N.America.
3. *T. laevis* (Kütz.) Ralfs var. *laevis*
 West 1904, 222, Pl.32, f.11–16; Krieger 1937, 455, Pl.54, f.9–12; Förster 1982, 301, Pl.39, f.1–4.
 L. 125 μm , B. 26 μm , I. 22 μm . St. 5. Indonesia (Borneo, Sumatra), Singapore, Europe, Australia. New to Thailand.
- 3a. var. *minutus* (DeBary) Krieger Pl.5, f.1.
 Krieger 1937, 457, Pl.55, f.8,9.

- L. 51–53 μm , B. 14–15 μm , I. 13 μm . Sts. 39,41. Europe, U.S.A., Africa. New to Thailand.
- 3b. var. *tropicus* Krieger Pl.1, f.14; Pl.22, f.14.
 Krieger 1932, 217, Pl.22, f.8; Krieger 1937, 457, Pl.54, f.13–15.
 L. 140 μm , B. 39.6 μm , I. 35 μm . St. 27. Indonesia (Java, Sumatra). New to Thailand.
1. *Cosmarium abbreviatum* Racib. var. *minus* (W. & G.S.West) Krieger & Gerloff Pl.18, f.12.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 242, Pl.42, f.18; Prescott et al. 2:3, 60, Pl.211, f.7.
 L. 6.5 μm , B. 7.5 μm , I. 2.2 μm . Cells minute, length approximately as long as the breadth or slightly broader than the length, deeply constricted, sinus linearly open; semi-cells subhexagonal, apex straight, lateral margin variable, normally divided into 2 or 3 sides. St. 53. Japan, Europe. New to Thailand.
2. *C. alpestre* Roy & Bisset Pl.13, f.9.
 West 1908, Brit. Desm. 3, 24, Pl.67, f.14; Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 333, Pl.54, f.1.
 L. 84–99 μm , B. 79–84 μm , I. 77–78 μm . Sts. 19,23,24. Japan, Europe, U.S.A., Africa, Australia. New to Thailand.
3. *C. amoenum* Bréb. Pl.13, f.6.
 West 1911, Brit. Desm. 4, 29, Pl.102, f.1–4; Pl.103, f.9; Förster 1982, 166, Pl.29, f.10.
 L. 55–59 μm , B. 30–31 μm , I. 23 μm . St. 1. Japan, Ceylon, Europe, Brazil. New to Thailand.
4. *C. anceps* Lund. var. *undulatum* Krieger & Gerloff Pl.17, f.18.
 Krieger & Gerloff 1965, Gatt. Cosm. 2, 185, Pl.37, f.5.
 L. 22 μm , B. 16.4 μm , I. 12.3 μm . Semicells subquadrate, apex retuse, lateral margin with 2 undulations. This species differs from *C. pseudo-speciosus* Racib. by the number of lateral undulations and a slightly lineally opened sinus. St. 18. N.America. New to Thailand.
5. *C. angulosum* Bréb. var. *angulosum* Pl.13, f.6.
 West 1908, 3, 93, Pl.72, f.35,36; Förster 1982, 166, Pl.24, f.15,16.
 L. 16.3–17 μm , B. 12–12.5 μm , I. 3.5–4 μm . Sts. 26,30. Cosmopolitan.
6. *C. apertum* Turner Pl.13, f.6.
 Turner 1892, K. Sv. Vet. Akad. Handl. 25:5, 54, Pl.8, f.11; Prescott et al. 1981, 2:3, 73, Pl.181, f.1,2.
 L. 23 μm , B. 22 μm , I. 5.7 μm . Cells small, almost as long as the breadth, constriction deep, sinus open widely but acuminate at the extremity; semicells subsemicircular, apex and lateral margins convex, lateral angles rounded; cell wall punctated. St. 25. In-

dia. New to Thailand.

7. *C. armatum* Joshua Pl.21, f.8.
 Joshua 1886, Jour. Linn. Soc. Bot. 21, 646, Pl.24, f.21–25; Prescott et al. 1981, 2:3, 74, Pl.213, f.1.
 L. 32–35 μm , B. 30–31 μm , I. 8–9 μm . Cells slightly longer than the breadth, constriction deep and narrowly linear; semicells trapeziform, apex straight or very slightly convex, apical angles with a denticulation, lateral margin convex and convergent with 3–4 denticulations almost equidistantly. This species differs from *C. ceylanicum* by the number of marginal denticulations and a central marking of semicell. Sts. 23,24,39. Burma. New to Thailand.
8. *C. askenasyi* Schmidle var. *latum* Scott & Prescott Pl.19, f.1.
 Scott & Prescott 1961, Hydrobiol. 17, 54, Pl.23, f.5.
 L. 145–154 μm , B. 119–123 μm , I. 48.5–53 μm . Sts. 10,25. Burma. New to Thailand.
9. *C. atomus* (Eckert) Krieger & Gerloff
 Krieger & Gerloff 1965, 315, Pl.49, f.10.
 L. 10 μm , B. 10 μm , I. 4.5 μm . Cells minute, isthmus linearly open, apex of semicell straight and somewhat retuse at the middle part. St. 1. Europe. New to Thailand.
10. *C. auriculatum* Reinsch var. *bogoriense* Bernard Pl.17, f.10.
 Bernard 1908, Dept. Agr. Indes Néerl. 116, Pl.7, f.181, 182; Krieger 1932, Arch. Hydrobiol Suppl. 11, 170, Pl.11, f.18.
 L. 48.5 μm , B. 48.5 μm , and I. 26.5 μm . St. 26. Indonesia (Java, Sumatra). New to Thailand.
11. *C. bengalense* (Grun.) Turner Pl.15, f.3.
 Turner 1892, K. Sv. Vet. Akad. Handl. 25, 56, Pl.8, f.33; Förster 1982, 167, Pl.25, f.7.
 L. 77–79 μm , B. 41–44 μm , and I. 17.5 μm . Sts. 49,51. India, Burma, Indonesia (Java, Sumatra), Taiwan, Japan, Australia.
12. *C. bimamillatum* Krieger Pl.19, f.3.
 Krieger 1932, 171, Pl.13, f.3; Prescott et al. 1981, 2:3, 80, Pl.246, f.6,9.
 L. 35–36 μm , B. 28.6–31 μm , and I. 8–9 μm . Cells slightly longer than the breadth, deeply constricted, sinus narrow and linear; semicells subrectangular, lateral margin converging upward, apex straight; cell wall granulated, a pair of large granules disposed below the apex, other granules small, disposed somewhat in radial series within the margin, central granules somewhat large in size and disposed transversally. Sts. 10,28,51. N. & S.America, Africa. New to Thailand.
13. *C. binerve* Lund. Pl.18, f.2.
 Krieger 1932, 171, Pl.10, f.1 (listed as a forms); Krieger & Gerloff 1969, 257, Pl.44, f.1.

- L. 53 μm , B. 26.4 μm , and I. 8.8 μm . St. 47. Indonesia (Sumatra). New to Thailand.
14. *C. binum* Nordst. Pl.18, f.26.
West 1908, 3, 246, Pl.88, f.10–14; Förster 1982, 168, Pl.38, f.4–5.
L. 48.5–64 μm , B. 35–46 μm , and I. 12.5–17.5 μm . Sts. 10,21,31,51,53. Cosmopolitan.
15. *C. bioculatum* Bréb. var. *depressum* (Schaarschm.) Schmidle
Krieger & Gerloff 1962, 61, Pl.15, f.6; Förster 1982, 170, Pl.20, f.15.
L. 12.7 μm , B. 12.7 μm , and I. 4.5 μm . St. 36. Cosmopolitan.
- 15a. var. *excavatum* Gutw.
Krieger & Gerloff 1962, 61, Pl.15, f.7; Prescott et al. 1981, 2:3, 82, Pl.174, f.8.
L. 22 μm , B. 17.6 μm , and I. 4.5 μm . St. 53. Europe, N.America.
- 15b. var. *hians* W. & G.S. West Pl.18, f.11.
Scott & Prescott 1961, 55, Pl.31, f.19; Prescott et al. 1981, 2:3, 82, Pl. 174, f.9–11.
L. 14 μm , B. 14 μm , and I. 4.4 μm , St. 53. Indonesia (Sumatra), Europe, N. America. New to Thailand.
16. *C. bireme* Nordst. Pl.15, f.8.
Scott & Prescott 1961, 55, Pl.32, f.25; Krieger & Gerloff 1965, 213, Pl.40, f.1.
L. 11.5–15.5 μm , B. 11–15.4 μm , and I. 3–5.3 μm . Semicells trapeziform, lower part of lateral margin rounded, upper part straight and convergent, apex straight; side view of a semicell circular with a papilla on each side. Sts. 18,19,32,47. Indonesia (Sumatra). New to Thailand.
17. *C. biretum* Bréb. var. *biretum* Pl.21, f.5.
Prescott et al. 1981, 83, Pl.272, f.10; Förster 1982, 171, Pl.32, f.4–5.
L. 48.5 μm , B. 50.6–63.8 μm , and I. 15.4–22 μm . Cells large, approximately as long as the breadth, sinus deep and dilated at the extremity; semicells obtrapeziform, apex straight but in some specimens distinctly retuse, apical angles broadly rounded, lateral margin convex and divergent upward; cell wall covered with granules, granules disposed in vertical and oblique series. Sts. 10,53. Cosmopolitan.
- 17a. var. *floridense* Wille
Prescott et al. 1981, 2:3, 84, Pl.277, f.11.
L. 68 μm , B. 66 μm , and I. 23 μm . St. 52. U.S.A. New to Thailand.
18. *C. blyttii* Wille var. *blyttii* Pl.19, f.8; Pl.26, f.24.
West 1908, 3, 225, Pl.86, f.1–4; Förster 1982, 172, Pl.36, f.6.
L. 15–17.6 μm , B. 13–14 μm , and I. 3.5–4.4 μm . Sts. 43,49. Cosmopolitan.
- 18a. var. *australianum* Schmidle Pl.18, f.34; Pl.26, f.25.
Scott & Prescott 1961, 55, Pl.31, f.15.
L. 16.3–17.6 μm , B. 15.4–16.7 μm , and I. 4.4–6.2 μm . Sts. 1,31,32,36,37,40,41,51. Indonesia (Java, Sumatra), Australia. New to Thailand.

- 18b. var. *novae-silvae* W. & G.S.West Pl.26, f.26.
 West 1908, 3, 227, Pl.86, f.5–6; Förster 1982, 173, Pl.36, f.7.
 L. 16.7 μm , B. 14–23 μm , and I. 3–5 μm . Sts. 31,32,44. Indonesia (Java), England.
 New to Thailand.
19. *C. borgei* (Hirano) Croasdale Pl.18, f.17
 Prescott et al. 1981, 2:3, 88, Pl.172, f.10,11. Syn. *C. bioculatum* Bréb. var. *borgei*
 Hirano 1968, Contr. Biol. Lab. Kyoto Univ. 21, 14, Pl.4, f.5.
 L. 30–31 μm , B. 23.8–24.6 μm , and I. 5.7–7.5 μm . St. 27. Japan, Europe, Alaska.
 New to Thailand.
20. *C. boergesenii* Grönblad Pl.16, f.12,13.
 Prescott et al. 2:3, 87, Pl.205, f.10.
 L. 30 μm , B. 17.6 μm , and I. 5 μm . Cells small, approximately 1.5 times longer
 than the breadth, deeply constricted, sinus narrowly linear; semicells subquadrate, basal
 part of lateral margin prominently produced and rounded, apical angles broadly round-
 ed, apex almost straight or slightly retuse at the middle; cell wall with a granule in the
 centre of semicell. St. 47. Alaska. New to Thailand.
21. *C. botrytis* Menegh. var. *botrytis*
 West 1911, 4, 1, Pl.96, f.1,2,5–15; Förster 1982, 175, Pl.33, f.1–2.
 L. 90 μm , B. 68 μm , and I. 26.5 μm . St. 18. Cosmopolitan.
- 21a. var. *paxillosporum* W. & G.S.West Pl.20, f.2.
 Prescott et al. 1981, 2:3, 90, Pl.265, f.8,9.
 L. 70.5–90 μm , B. 59–68 μm , and I. 24–26.4 μm . Cells large, approximately 1.3
 times longer than the breadth, constriction deep and sinus narrowly linear; semicells
 truncate-pyramidate, lateral margin convex and convergent, apex narrow and straight;
 cell wall granulate, granules disposed at lateral margin and intramarginal, granular series
 radial and concentric, central part of a semicell with an oblique and vertical series of
 scrobiculations, the space between granules and scrobiculations smooth. St. 49. Europe,
 U.S.A. New to Thailand.
22. *C. brasiliense* (Wille) Nordst.
 Förster 1982, 177, Pl.29, f.11.
 L. 25.5 μm , B. 21 μm , and I. 10 μm . Cells small, median constriction deep, sinus
 open outward but acuminate at the extremity; semicells obversely and transversely
 ovate, apex scarcely straight or flattened; cell wall covered with small granules regularly
 disposed. St. 27. Brazil. New to Thailand.
23. *C. ceylanicum* W. & G.S.West f. *ceylanicum*
 West 1902, Trans. Linn. Soc. Bot. 6, 174, Pl.21, f.14,15; Krieger 1932, 173, Pl.11, f.9
 (forma).
 L. 33 μm , B. 27 μm , and I. 8 μm . St. 23. Sri Lanka (Ceylon). New to Thailand.
- 23a. forma *minus* Scott & Prescott Pl.19, f.10; Pl.21, f.15.

Scott & Prescott 1961, 56, Pl.31, f.5.

L. 28.6 μm , B. 25.5 μm , and I. 7.5 μm . Cells of medium size, 1.5 times longer than the breadth, constriction deep and sinus narrowly linear; semicells trapeziform, apex straight, lateral margin convex-undulate, granules equidistantly disposed; cell wall with 4 large granules just below the apex, a group of scrobiculations disposed in the central part of a semicell; side view of semicell circular, apex almost straight. St. 32,36,37,40,41,51. Indonesia (Java, Sumatra). New to Thailand.

24. *C. circulare* Reinsch var. *circulare*

West 1905, 2, 136, Pl.61, f.11,13–14; Förster 1982, 179, Pl.21, f.1.

L. 44 μm , B. 54 μm , and I. 16 μm . St. 39. Ceylon, Japan, Europe, Africa. New to Thailand.

24a. var. *messikommeri* Krieger & Gerloff

Krieger & Gerloff 1962, Gatt. Cosm. 1, 2, Pl.1, f.3.

L. 44 μm , B. 36.5 μm , and I. 15.4 μm . Cells slightly longer than those of typical form; semicells perfectly semicircular. St. 19. Europe. New to Thailand.

25. *C. clepsydra* Nordst. var. *dissimile* Krieger & Gerloff

Pl.18, f.8.

Krieger & Gerloff 1962, Gatt. Cosm. 1, 145, Pl.30, f.9.

L. 23 μm , B. 22 μm , and I. 6.5 μm . St. 50. Europe, Brazil, Africa. New to Thailand.

25a. var. *truncatum* Gutw.

Pl.18, f.5.

Krieger & Gerloff 1962, 147, Pl.30, f.16.

L. 19.5 μm , B. 18 μm , and I. 4.4 μm . St. 47. Europe. New to Thailand.

26. *C. connatum* Bréb.

Pl.16, f.23.

West 1908, 3, 25, Pl.67, f.15–17; Krieger 1932, 173, Pl.8, f.14,15; Krieger & Gerloff 1969, 327, Pl.52, f.1.

L. 73.5 μm , B. 57 μm , and I. 52 μm . Sts. 10,12,32. India, Burma, Singapore, Indonesia (Sumatra), Japan, Europe, U.S.A., Africa.

27. *C. contractum* Kirchn. var. *contractum*

Pl.13, f.10; Pl.14, f.4.

West 1905, 2, 170, Pl.61, f.23–25; Krieger 1932, 173, Pl.9, f.1; Förster 1982, 184, Pl.19, f.15–17.

L. 31–44 μm , B. 19–31 μm , and I. 4.5–7.5 μm . Sts. 1,10,32,47,53. Indonesia (Java, Sumatra), India, Ceylon, Burma, Europe, U.S.A., Chile (Patagonia), Africa, Madagascar.

27a. var. *ellipsoideum* (Elfv.) W. & G.S.West

West 1905, 2, 172, Pl.61, f.28,35; Förster 1982, 185, Pl.19, f.19.

L. 28–50 μm , B. 20–35 μm , and I. 5.3–8 μm . Sts. 26,36,37,44. Cosmopolitan.

27b. var. *indentatum* (Grönblad) Krieger & Gerloff

Pl.15, f.5.

Krieger & Gerloff 1962, 74, Pl.17, f.6.

L. 46 μm , B. 31 μm , and I. 7.5 μm . Central part of semicell thickened brown in colour, sinus more opened than that of the typical form, broadly rounded at the extrem-

ity. Station in Thailand is indistinct. Europe.

- 27c. var. *minutum* (Delp.) W. & G.S.West
 West 1908, 3, 209; Krieger & Gerloff 1962, 75, Pl.17, f.8; Förster 1982, 250, Pl.30, f.13–15.
 L. 22–28.5 μm , B. 17.5–22 μm , and I. 4.5–6.5 μm . Sts. 1,31,36,43,47. Cosmopolitan.
28. *C. controversum* W.West Pl.20, f.7.
 West 1911, 4, 9, Pl.97, f.7–8; Förster 1982, 187, Pl.32, f.3.
 L. 101 μm , B. 79 μm , and I. 35 μm . St. 21. Europe, S.America, Africa.
29. *C. crenatum* Ralfs forma *boldtiana* (Gutw.) W. & G.S.West Pl.21, f.14.
 West 1911, 4, 37, Pl.98, f.13,14; Prescott et al. 2:3, 113, Pl.279, f.3.
 L. 28.6 μm , B. 20 μm , and I. 9 μm . St. 47. Indonesia (Sumatra), Europe.
30. *C. crispatum* Hirano Pl.18, f.33.
 Hirano 1957, Contr. Biol. Lab. Kyoto Univ. 5, 132, Pl.20, f.39; Krieger & Gerloff 1962, 36, Pl.11, f.1.
 L. 32 μm , B. 28 μm , and I. 6.5 μm . St. 40. Japan. New to Thailand.
31. *C. cucumis* Corda
 West 1905, 2, 152, Pl.59, f.18–20; Krieger & Gerloff 1962, 86, Pl.19, f.11.
 L. 57 μm , B. 42 μm , and I. 22 μm . St. 1. Cosmopolitan.
32. *C. cuneatum* Joshua Pl.20, f.4.
 Joshua 1886, Journ. Linn. Soc. Bot. 21, 647, Pl.24, f.17; West 1902, Trans. Linn. Soc. 6, 173, Pl.21, f.11; Hirano 1967, Nature & Life SE. Asia 5, 46, Pl.9, f.8.
 L. 39.6–42 μm , B. 28–45 μm , and I. 6.5–9 μm . Sts. 32,51. Thailand, Burma, Borneo, Sumatra.
33. *C. decachondrum* Roy & Bisset
 Roy & Bisset 1886, Jour. Bot. 24, 196. Pl.268, f.15; Prescott et al. 2:3, 120, Pl.224, f.3.
 L. 32 μm , B. 32 μm , and I. 8 μm . St. 51. Japan, Europe, U.S.A., Africa. New to Thailand.
34. *C. decedens* (Reinsch) Racib. var. *decedens* Pl.26, f.18.
 West 1908, 3, 43, Pl.69, f.6–8; Krieger & Gerloff 1965, 178, Pl.36, f.10.
 L. 48.4 μm , B. 21 μm , and I. 15.4 μm . St. 5. Burma, Indonesia (Java), Japan, Europe, Canada, S.America. New to Thailand.
- 34a. var. *borgei* Krieger
 Krieger & Gerloff 1965, 179, Pl.36, f.13.
 L. 35 μm , B. 22 μm , and I. 9 μm . Lateral margins of a semicell slightly undulate, apex retuse, apical angles rounded, sinus linearly open slightly. St. 3. Norway (Spitzbergen), Alaska. New to Thailand.

35. *C. decoratum* W. & G.S.West Pl.20, f.8.
 Krieger 1932, 175, Pl.12, f.15; Scott & Prescott 1961, 57, Pl.25, f.1.
 L. 62 μm , B. 44 μm , and I. 17.6 μm . Sts. 31,53. Indonesia (Sumatra). New to Thailand.
36. *C. depressum* (Näg.) Lund. var. *depressum* Pl.16, f.4.
 West 1905, 2, 176, Pl.62, f.2–5; Krieger 1932, 175, Pl.9, f.17; Hirano 1967, Nat. Life SE Asia 5, 46.
 L. 28–31 μm , B. 27–32 μm , and I. 7–8 μm . Sts. 1,43,51,53. Cosmopolitan.
- 36a. var. *achondrum* (Boldt) W. & G.S.West Pl.17, f.24.
 West 1905, 2, 177, Pl.62, f.6–9; Krieger & Gerloff 1962, 21, Pl.8, f.2; Förster 1982, 197, Pl.20, f.17.
 L. 33 μm , B. 35 μm , and I. 8 μm . St. 43. Europe, N.America New to Thailand.
- 36b. var. *minutum* (Heimerl) Krieger & Gerloff Pl.16, f.10.
 Krieger & Gerloff 1962, Gatt. Cosm. 1, 24, Pl.8, f.8.
 L. 26.4 μm , B. 22 μm , and I. 5.3 μm . St. 27. Indonesia (Java), China, Europe, N. & S.America, Africa.
- 36c. var. *planctonicum* Reverdin Pl.17, f.6.
 Krieger & Gerloff 1962, Gatt. Cosm. 1, 24, Pl.8, f.9.
 L. 27–29 μm , B. 29.5–34 μm , and I. 6.5–7 μm . St. 23. Cosmopolitan.
37. *C. dichondrum* W. & G.S.West Pl.18, f.25.
 Krieger 1932, 175, Pl.12, f.10.
 L. 20 μm , B. 17.6 μm , and I. 5.7 μm . Cells small, slightly longer than the breadth, deeply constricted, sinus narrowly linear; semicells truncate-subcircular, apex flattened, apical angles broadly rounded, lateral margin convex and convergent, lateral angles broadly rounded. St. 49. Indonesia (Sumatra, Bali). New to Thailand.
38. *C. dispersum* Johnson var. *truncatum* (W. & G.S.West) Krieger & Gerloff Pl.27, f.10.
 Krieger & Gerloff 1962, Gatt. Cosm. 1, 46, Pl.12, f.8.
 L. 53 μm , B. 50.5 μm , and I. 15.4 μm . Semicells subtrapeziform, apex straight but slightly undulate, lateral margin crenulate and slightly convex; cell wall punctate. St. 2. Burma. New to Thailand.
39. *C. divergens* Krieger Pl.51, f.20.
 Krieger 1932, 175, Pl.11, f.20.
 L. 20–26 μm , B. 20.7–24 μm , and I. 5–6.5 μm . Sts. 12,51. Indonesia (Java). New to Thailand.
40. *C. doliforme* W. & G.S.West Pl.18, f.14.
 Prescott et al., 1981, 2:3, 129, Pl.98, f.9–10.
 L. 29–29.5 μm , B. 17–18 μm , and I. 5.3–6.5 μm . Semicells truncate-pyramidal, lateral margin straight or slightly undulate (undulations 3 in number), apex faintly retuse, apical and basal angles obtuse and noN rounded. This species is similar to *C.*

pseudopyramidatum var. *abruptum* Krieger & Gerloff. It is however different from the latter by the small size and elongated form. Sts. 3,40. N. America. New to Thailand.

41. *C. dubium* Borge Pl.13, f.8; Pl.17, f.11.
 Scott & Prescott 1961, 58, Pl.32, f.3.
 L. 27.5–28 μm , B. 18.5–20 μm , and I. 4.5–6.5 μm . Cells 1.5 times longer than the breadth; semicells truncate-pyramidal, lateral margin undulate, undulations 3 in number, apex retuse; vertical view of a semicell long elliptic with a papilla on each side. Sts. 21,23, Indonesia (Borneo, Java, Sumatra). New to Thailand.
42. *C. exasperatum* Joshua var. *spinatum* Scott & Prescott
 Scott & Prescott 1961, Hydrobiol. 17, 58, Pl.31, f.11.
 L. 35–36 μm , B. 37–40 μm , I. 9–12 μm . Sts. 1,39,40,41. Indonesia. New to Thailand.
43. *C. exiguum* Arch. var. *exiguum*
 West 1908, 3, 63, Pl.70, f.17–19; Förster 1982, 202, Pl.22, f.19.
 L. 20 μm , B. 12 μm , I. 5.3 μm . St. 18. Cosmopolitan.
- 43a. f. *ocellatum* Grönblad & Croasd.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 272, Pl.45, f.7.
 L. 17.6 μm , B. 5.5 μm , I. 7.5 μm . St. 36. Africa. New to Thailand.
44. *C. fuellebornei* Schmidle Pl.17, f.16.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 334, Pl.54, f.3.
 L. 59.4 μm , B. 35 μm , I. 11 μm . St. 19. Africa, Brazil. New to Thailand.
45. *C. garrolense* Roy & Bisset var. *pyramidatum* Krieger & Gerloff Pl.18, f.9.
 Krieger & Gerloff 1962, Gatt. Cosm. 1, 44, Pl.12, f.3.
 L. 25.5 μm , B. 22 μm , I. 6.5 μm . Semicells semicircular, apex slightly convex, lateral margin undulate (undulations 5 in number). This variety differs from *C. undulatum* var. *minutum* by the slightly convexed form. Moreover the latter has a undulations. St. 10. Indonesia (Java, Sumatra). New to Thailand.
46. *C. granatum* Bréb. var. *granatum* Pl.16, f.20; Pl.17, f.15.
 West 1905, 2, 186, Pl.63, f.1–3; Förster 1982, 205, Pl.22, f.5–7.
 L. 35–39 μm , B. 22–26.5 μm , I. 4.5–6.5 μm . Sts. 11,12,20,26,32,50,51. Cosmopolitan.
- 46a. var. *rotundatum* Krieger
 Krieger 1932, Arch. Hydrobiol. Suppl.11, 177, Pl.10, f.21.
 L. 33 μm , B. 22 μm , I. 6.5 μm . St. 18. Indonesia (Borneo, Sumatra). New to Thailand.
47. *C. hammeri* Reinsch var. *protuberans* W. & G.S.West Pl.15, f.16.
 W. & G.S.West 1905, 2, 183, Pl.62, f.24,25; Krieger & Gerloff 1962, 104, Pl.21, f.13.
 L. 30 μm , B. 18 μm , I. 6.5 μm . Sts. 16,28. Cosmopolitan.

- 47a. var. *schmidlei* Grönblad & Scott
 Krieger & Gerloff 1962, 104, Pl.29, f.2; Prescott et al. 1981, 2:3, 151, Pl.182, f.12,13.
 L. 35 μm , B. 40 μm , I. 9 μm . Cells of a medium size, a little longer than the breadth, deeply constricted, sinus narrowly linear; semicells trapeziform, apex slightly convex, lateral margin convex and upper margin slightly retuse; vertical view of a semicell rhomboidal-oblong, poles rounded. St. 32. Africa. New to Thailand.
48. *C. humile* (Gay) Nordst. var. *glabrum* Gutw.
 Förster 1982, 210, Pl.36, f.14.
 L. 13 μm , B. 11 μm , I. 1.3 μm . Cells small, a little longer than the breadth; semicells subrectangular, apex straight with 4-crenations, lateral margin bicrenate in the lower part, retuse and convergent in the upper part; cell wall smooth. St. 53. Japan, Europe. New to Thailand.
49. *C. hypochondrum* Scott & Grönblad f. *hypochondrum* Pl.16, f.8.
 Prescott et al. 1981, 2:3, 158, Pl.189, f.13.
 L. 31 μm , B. 16.7 μm , I. 14 μm . St. 28. U.S.A. New to Thailand.
- 49a. f. *retusum* Scott & Grönblad
 Prescott et al. 2:3, 159, Pl.189, f.14.
 L. 26.4 μm , B. 13 μm , I. 6.5 μm . St. 30. U.S.A. New to Thailand.
50. *C. impressulum* Elfv. var. *impressulum* Pl.15, f.15; Pl.18, f.30.
 West 1908, 3, 36, Pl.72, f.14–18; Förster 1982,243, Pl.26, f.1.
 L. 17.6–31 μm , B. 13–18 μm , I. 4.5–6.5 μm . Sts. 25,26,32,43,51. Cosmopolitan.
- 50a. var. *crenulatum* (Näg.) Krieger Pl.16, f.25.
 Krieger & Gerloff 1965, Gatt. Cosm. 2, 136, Pl.29, f.6; Förster 1982, 212, Pl.26, f.4.
 L. 24–30 μm , B. 17–28.6 μm , I. 5.7–6.5 μm . Sts. 43,53. Europe, N. & S. America, Africa. New to Thailand.
51. *C. incertum* Schmidle var. *incertum* Pl.17, f.3,4.
 Krieger & Gerloff 1965, 193, Pl.57, f.19.
 L. 22 μm , B. 13 μm , I. 8 μm . St. 19. Europe. New to Thailand.
- 51a. var. *borgei* Krieger & Gerloff Pl.18, f.15.
 Krieger & Gerloff 1965, 194, Pl.37, f.20.
 L. 26.4 μm , B. 15.4 μm , I. 5.7 μm . St. 36. Sweden. New to Thailand.
52. *C. indentatum* Grönblad var. *ellipticum* Scott & Grönblad Pl.17, f.15.
 Scott Prescott 1961, Hydrobiol. 17, 59, Pl.27, f.7.
 L. 26.4–33 μm , B. 26.4–33 μm , I. 5.3–6.5 μm . Cells as long as the breadth, deeply constricted, sinus sublinearly open; semicells transversely elliptic or reniform; side view of semicell elliptic. St. 20. Indonesia (Sumatra). New to Thailand.
53. *C. isthmochondrum* Nordst. var. *pergranulatum* W. & G.S.West
 Prescott et al. 1981, 2:3, 165, Pl.229, f.7.

L. 28 μm , B. 26.4 μm I. 8 μm . Cells hexagonal in outline, a little longer than the breadth, deeply constricted, sinus narrowly linear; semicells subtrapeziform, apex almost straight, apical angles obtuse with a denticulation, lateral margin slightly convex and with 3 marginal teeth, inner part of a semicell with a pair of large granules just below the apex; with small granules irregularly disposed within the lateral margin and in some specimens these small granules somewhat arcuately disposed. The size of the specimens examined is smaller than the dimension given by Prescott et al. St. 53. Europe, N.America. New to Thailand.

54. *C. javanicum* Nordst. var. *javanicum*

Hirano 1957, Contr. Biol. Lab. Kyoto Univ. 4, 118, Pl.21, f.2; Krieger & Gerloff 1962, Gatt. Cosm. 1,88, Pl.19, f.14.

L. 114 μm , B. 66 μm , I. 48.5 μm . Sts. 44,51. Indonesia (Java, Sumatra), Ceylon, India, Australia.

54a. var. *elongatum* Krieger & Gerloff

Pl.15, f.1.

Krieger & Gerloff 1962, Gatt. Cosm. 1, 88, Pl.19, f.15.

L. 163–198 μm , B. 77–88 μm , I. 42–44 μm . Sts. 21,25,26,43,51. Australia. New to Thailand.

55. *C. laeve* Rabenh. var. *messikommeri* Croasd.

Prescott et al. 1981, 2:3, 168, Pl.293, f.21,22.

L. 18.5 μm , B. 12.3 μm , I. 4.5 μm . St. 31. Europe. New to Thailand.

56. *C. lunatum* Wolle var. *orientale* Scott & Prescott

Pl.17, f.7,8.

Scott & Prescott 1961, Hydrobiol. 17, 60, Pl.32, f.5.

L. 17–20.6 μm , B. 22–26 μm , I. 8 μm . Sts. 3,39. Indonesia (Borneo). New to Thailand.

57. *C. lundellii* Delp. f. *crassangulatum* Scott & Prescott

Pl.14, f.6.

Scott & Prescott 1961, 61., Pl.25, f.10.

L. 49–70.4 μm , B. 48.4–70.4 μm , I. 21–33 μm . Cells as long as the breadth, deeply constricted, sinus open outward but acuminate at the extremity; semicells irregular rhomboidal, lateral angles somewhat acutely rounded and thickened. Sts. 23,32,43. Indonesia (Java). New to Thailand.

57a. var. *circularis* (Reinsch) Krieger

Pl.14, f.5.

Krieger 1932, 178, Pl.9, f.21; Scott & Prescott 1961, Pl.25, f.7.

L. 54–70 μm , B. 44–57 μm , I. 16.7–18.7 μm , Sts. 20,25,32,43,47,51,53. Indonesia (Sumatra, Bali). New to Thailand.

57b. var. *ellipticum* W.West

Pl.15, f.2.

Krieger 1932, 178, Pl.9, f.20; Scott & Prescott 1961, 61, Pl.25, f.8; Prescott et al. 1981, 2:3, 179, Pl.160, f.7.

L. 55–60 μm , B. 42–48.5 μm , I. 11–15 μm . Sts. 31,44. Indonesia (Java), Japan, Europe, Australia, New Zealand. New to Thailand.

58. *C. maculatiforme* Schmidle var. *major* Gutw. Pl.14, f.1.
 Skuja 1949, Act. Regn. Soc. Sci. Upsala ser.4, 14:5, 126, Pl.27, f.18; Hirano 1967, Nature & Life SE. Asia 5, 49, Pl.11, f.3.
 L. 141–198 μm , B. 75.5–86 μm , I. 35–44 μm . Sts. 11,19,21,25,26,44,47. Burma, Indonesia (Java), Thailand.
59. *C. mansangense* W. & G.S.West Pl.18, f.27,29.
 Krieger 1932, 179, Pl.11, f.17; Scott & Prescott 1961, 62, Pl.28, f.11, 12; Förster 1982, 218, Pl.29, f.8.
 L. 48.5–62 μm , B. 22–24 μm , I. 17.5 μm . Sts. 1,25,26,35–37,40,41,47,50. Indonesia (Java, Sumatra), Africa.
60. *C. margaritatum* (Lund.) Roy & Bisset Pl.21, f.3.
 West 1911, 4, 18, Pl.100, f.1; Förster 1982, 218, Pl.31, f.1,3.
 L. 79 μm , B. 71.5 μm , I. 22 μm . Sts. 2,32,36. Cosmopolitan.
61. *C. margaritifera* Menegh.
 West 1908, 3, 199, Pl.83, f.4–11; Förster 1982, 219, Pl.31, f.5,6.
 L. 62–66 μm , B. 46–48.5 μm , I. 20 μm . St. 25. Cosmopolitan.
62. *C. medioscrobiculatum* W. & G.S.West var. *egranulatum* Gutw. Pl.16, f.9.
 Scott & Prescott 1961, 63, Pl.26, f.3.
 L. 48.4–55 μm , B. 48.5–50 μm , I. 20–22 μm . Cells of medium size, deeply constricted, sinus narrowly linear but the outer part open widely; semicells subsemicircular, lateral margin slightly produced, apex convex; with a group of scrobiculations in the centre of a semicell. Sts. 10,44. Indonesia (Java, Borneo). New to Thailand.
63. *C. moniliforme* (Turp.) Ralfs var. *moniliforme* Pl.15, f.9.
 West 1908, 3, 20, Pl.67, f.1–3; Krieger & Gerloff 1969, 337, Pl.51, f.2; Förster 1982, 224, Pl.19, f.14.
 L. 40–64 μm , B. 22–31 μm , I. 8–9 μm . Sts. 10,28,36,38,39,40. Cosmopolitan.
- 63a. var. *ellipticum* (Lagerh.) Krieger & Gerloff
 Krieger & Gerloff 1969, 338, Pl.54, f.5; Prescott et al. 1981, 2:3, 192, Pl.202, f.6, Pl.203, f.3,4.
 L. 28.6–42 μm , B. 20–24 μm , I. 4.5–7 μm . Sts. 1,25,26. Indonesia (Sumatra), Europe, U.S.A., Australia. New to Thailand.
- 63b. var. *indentatum* Scott & Grönblad Pl.51, f.18.
 Scott & Prescott 1961, 63, Pl.27, f.10; Krieger & Gerloff 1969, 339, Pl.71, f.15; Prescott et al. 1981, 2:3, 192, Pl.203, f.1.
 L. 33–40 μm , B. 17.5–22 μm , I. 4.4–5.7 μm . Sts. 31,36. Indonesia (Sumatra). New to Thailand.
- 63c. var. *limneticum* W. & G.S.West
 West 1908, 3, 23, Pl.67, f.6,7; Scott & Prescott 1961, 63, Pl.27, f.11, 12; Krieger & Gerloff 1969, 339, Pl.51, f.4.

- L. 22–35 μm , B. 13–20 μm , I. 7–11 μm . Sts. 25,32. Indonesia (Sumatra), Australia. New to Thailand.
- 63d. var. *pandriforme* (Heimerl) Schmidle Pl.16, f.6; Pl.17, f.12.
West 1908, 3, 22, Pl.67, f.8,9; Krieger & Gerloff 1969, 340, Pl.51, f.5.
L. 33 μm , B. 19 μm , I. 13 μm . Sts. 19,31,32. Europe, Australia. New to Thailand.
64. *C. minimum* W. & G.S.West var. *subrotundatum* W. & G.S.West
West 1895, Trans. Linn. Soc. ser.2, 5:2, 59, Pl.8,f.11; Prescott et al. 1981, 189, Pl.206, f.8.
L. 11 μm , B. 9.7 μm , I. 6.5 μm . Cells minute, subrectangular, noN deep, sinus open, apex of a semicell straight, apical angles obtuse, lateral margin slightly convergent. St. 8. U.S.A. New to Thailand.
65. *C. monomazum* Lund. var. *dimazum* Krieger Pl.19, f.4.
Krieger 1932, 180, Pl.11, f.19.
L. 33–35 μm , B. 31–35 μm , I. 11–12.3 μm . Sts. 19,51. Indonesia (Sumatra), Africa, S.America. New to Thailand.
66. *C. nitidulum* DeNot. var. *javanicum* Krieger & Gerloff Pl.18, f.7; Pl.26, f.17.
Krieger & Gerloff 1965, 164, Pl.34, f.6; Prescott et al. 1981, 2:3, 198, Pl.189, f.5,6.
L. 15 μm , B. 12 μm , I. 4.5 μm . Sts. 32,47. Indonesia (Java), U.S.A. New to Thailand.
67. *C. norimbergense* Reinsch f. *depressum* W. & G.S.West Pl.15, f.17.
West 1908, 3, 53, Pl.69, f.28,29; Scott & Prescott 1961, 63, Pl.32, f.6,7.
L. 14–17.5 μm , B. 13–15.5 μm , I. 4.5 μm . Sts. 43,51,53. Cosmopolitan.
68. *C. nudum* (Turner) Gutw. Pl.14, f.7.
Krieger & Gerloff 1962, 34, Pl.9, f.13; Pl.10,f.3; Prescott et al. 1981, 2:3, 202, Pl.158, f.2.
L. 50.6 μm , B. 52.3 μm , I. 13 μm . Cells approximately as long as the breadth or a little longer, deeply constricted, sinus deep and closed, the inner half part narrow-linear, and the outer part slightly open; semicells semicircular, basal angles slightly produced downward and thickend, apex scarcely straight. This species is similar to *C. taxichondriforme*. However the basal part of a semicell of the former distinctly thickened. St. 23. Asia, Europe, U.S.A. New to Thailand.
69. *C. obliquum* Nordst. var. *tatrica* (Gutw.) Krieger & Gerloff Pl.26, f.16.
Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 299, Pl.48, f.15.
L. 20 μm , B. 16 μm , I. 12 μm . Sts. 3,8. Japan, Europe. New to Thailand.
70. *C. obsoletum* (Hantz.) Reinsch var. *obsoletum* Pl.15, f.11.
West 1905, 2, 33, Pl.56, f.1–3; Krieger & Gerloff 1962, Gatt. Cosm. 1, 7, Pl.3, f.1.
L. 35–42 μm , B. 40–48 μm , I. 13–15 μm . Sts. 1,25,28,29,36,40,41,43,49. Japan, Europe, N. & S.America, Africa, Australia.

- 70a. var. *sitvense* Gutw. Pl.15, f.12.
 Scott & Prescott 1961, Hydrobiol. 17, 63, Pl.26, f.2.
 L. 53 μm , B. 57–77 μm , I. 27–37 μm . Sts. 25,26,32,39,43,51,53. Indonesia (Java, Sumatra), Borneo, Japan. New to Thailand.
71. *C. obtusatum* (Schmidle) Schmidle Pl.18, f.31.
 West 1908, 3, 7, Pl.65, f.13,14; Förster 1982, 228, Pl.28, f.10.
 L. 40–57 μm , B. 33–53 μm , I. 11 μm . St. 31. Japan, Europe, Africa.
72. *C. ocellatum* Eichl. & Gutw. Pl.17, f.22.
 West 1905, 2, 144, Pl.58, f.6; Förster 1982, 229, Pl.22, f.9,10.
 L. 22 μm , B. 17.6 μm , I. 4.5 μm . St. 53. Japan, Europe. New to Thailand.
73. *C. ordinatum* (Börger.) W. & G.S.West var. *borgei* Scott & Grönblad Pl.21, f.4.
 Scott & Prescott 1961, 64, Pl.31, f.7; Prescott et al. 1981,2:3, 209, Pl.251, f.10.
 L. 31–33 μm , B. 28–30 μm , I. 9–12 μm . Sts. 1,26,28,29,36,39,41. Indonesia (Borneo), U.S.A., S.America.
74. *C. orthostichum* Lund. var. *compactum* W. & G.S.West f. *divaricatum* Bicudo Pl.19, f.7.
 Prescott et al. 1981, 2:3, 212, Pl.289, f.5.
 L. 19.4 μm , B. 19.4 μm , I. 6.6 μm . St. 49. U.S.A.
- 74a. var. *pumilum* Lund.
 West 1908, 3, 169, Pl.80, f.20,21; Förster 1982, 233, Pl.30, f.8,9.
 L. 13 μm , B. 12 μm , I. 4.5 μm . Semicells trapeziform, lateral margin convex, apex truncate and undulate; cell wall with fairly large granules as compared with the cell size. Cells of the specimens examined are smaller than those in the descriptions reported by the other authors. St. 25. Cosmopolitan.
75. *C. otus* Krieger
 Krieger 1932, 181, Pl.11, f.8; Prescott et al. 1981, 2:3, 215, Pl.270 f.4,5.
 L. 50.6 μm , B. 44 μm , I. 11 μm . St. 53. Indonesia (Sumatra), Japan. New to Thailand.
76. *C. ozense* Hirano
 Hirano 1957, Contr. Biol. Lab. Kyoto Univ. 5, 203, Pl.28, f.38.
 L. 16.7 μm , B. 15.4–17.6 μm , I. 5.3–6 μm . Sts. 5,47. Japan. New to Thailand.
 Cells small, a little longer than the breadth, deeply constricted, sinus narrowly linear; semicells trapeziform, apex almost straight, apical angles broadly rounded, lateral margin slightly convex and convergent upward.
77. *C. pachydermum* Lund. var. *pachydermum*
 West 1905, 2, 139, Pl.57, f.7; Scott & Prescott 1961, 64, Pl.25, f.5.
 L. 75 μm , B. 58 μm , and I. 31 μm . St. 20. Cosmopolitan. New to Thailand.
- 77a. var. *minus* Nordst. Pl.17, f.1.

- Krieger & Gerloff 1962, Gatt. Cosm. 1, 16, Pl.5, f.7.
 L. 57–70 μm , B. 44–57 μm , and I. 24–28 μm . St. 26. Burma, Ceylon, Singapore, Indonesia (Sumatra), Europe, U.S.A., Australia. New to Thailand.
78. *C. papilliferum* Schmidle
 Prescott et al. 2:3, 1981, 218, Pl.234, f.10.
 L. 57 μm , B. 44 μm , and I. 19 μm . St. 49. U.S.A., Africa. New to Thailand.
79. *C. peniomorphum* Scott & Prescott
 Scott & Prescott 1961, 403, Pl.72, f.11; Krieger & Gerloff 1969, Gatt. Cosm. 3–4, p.403, Pl.68, f.19.
 L. 20.6 μm , B. 9 μm , and I. 7.5 μm . St. 35. Ceylon, Africa. New to Thailand.
80. *C. perfissum* G.S.West Pl.17. f.26.
 Scott & Prescott 1961, 65, Pl.26, f.8.
 L. 15.4 μm , B. 22 μm , and I. 4.4 μm . Sinus of cell acutely open, semicell depressed reniform, with many scrobiculations. The specimens from Thailand which I have examined are somewhat small in size; the shape of cells is very similar to the Indonesian form. St. 51. Indonesia (Sumatra). New to Thailand.
81. *C. perpastum* Turner Pl.16, f.2.
 Turner 1892, K. Sv. Vet. Akad. Handl. 25, 48, Pl.7, f.23; Hirano 1967, Nature Life SE. Asia, 5, 51, Pl.9, f.3.
 L. 123 μm , B. 61 μm , and I. 44 μm . St. 51. India, Thailand.
82. *C. phaseolus* Bréb. var. *phaseolus*
 West 1905, 2, 158, Pl.60, f.12–14; Krieger & Gerloff 1962, 53, Pl.14, f.3; Förster 1982, 237, Pl.20, f.19–20.
 L. 30 μm , B. 27 μm , and I. 10 μm . St. 1, India, Europe, U.S.A., Africa, New Zealand. New to Thailand.
- 82a. var. *elevatum* Nordst. Pl.18, f.3,4.
 West 1905, 2, 159, Pl.60, f.16,17; Hirano 1967, Nature Life 5,51; Förster 1982, 238, Pl.20, f.22.
 L. 27.7–30.8 μm , B. 24–26 μm , and I. 5.3–6.5 μm . Cells slightly longer than the breadth, deeply constricted, sinus narrowly linear; semicells somewhat hexagonal-elliptic, apex truncate and straight, apical angles broadly rounded, with a mamillate wart just below the apex; side view of a semicell obversely ovoidal, apex convex, with a round wart on each side of the apex. The shape of the semicell of the specimens examined resembles to *C. clepsydra* Nordst, which is figured by Grönblad. However, the shape of my specimens are not coincident with the original figure, at the latter in Nordstedt. St. 9. Europe, Thailand.
83. *C. polygonum* (Näg.) Arch. Pl.16, f.19.
 West 1908, 3, 76, Pl.71, f.32–34; Prescott et al. 1981, 2:3, 227, Pl.216, f.8.
 L. 17.6 μm , B. 16.7 μm , and I. 5.3 μm . Cells small, deeply constricted, sinus

narrow-linear; semicells depressed hexagonal, apex straight, apical angles obtuse, upper lateral margin retuse, lower margin divergent and straight. St. 44. Cosmopolitan.

84. *C. portianum* Arch. var. *portianum* Pl.19, f.9.
 West 1908, 3, 165, Pl.80, f.4–7; Scott & Prescott 1961, 65, Pl.28, f.8.
 L. 22–30 μm , B. 17.6–22 μm , and I. 6.5–9 μm . Sts. 25,26 India, Ceylon, Japan, U.S.A., Brazil, Australia. New to Thailand.
- 84a. var. *majus* Scott & Prescott Pl.19, f.6; Pl.20, f.6.
 Scott & Prescott 1961, 65, Pl.28, f.9.
 L. 41.5–60 μm , B. 31–48 μm , and I. 12–20 μm . Sts. 10,26. Indonesia (Java). New to Thailand.
- 84b. var. *nephroideum* Witttr. Pl.20, f.10.
 West 1908, 3, 167, Pl.80, f.10,11; Scott & prescott, 1961, 66, Pl.28, f.10; Prescott et al. 1981, 2:3, 230, Pl.254, f.4.
 L. 23–35 μm , B. 20–27 μm , and I. 5.3–9 μm . St. 43. Indonesia (Borneo), Japan, Europe, New to Thailand.
85. *C. praecisum* Borge var. *suecicum* (Borge) Krieger & Gerloff Pl.15, f.6.
 Krieger & Gerloff 1962, Gatt. Cosm. 1, 92, Pl.20, f.9.
 L. 13 μm , B. 13 μm , and I. 4.5 μm . Cells small, deeply constricted, sinus linearly open; semicells trapeziform, apex and lateral margins straight. St. 10,11. Europe, Malaysia.
86. *C. prae grande* Lund. Pl.27, f.1.
 West 1908, 3, 150, Pl.77, f.19; Förster 1982, 239, Pl.29, f.7.
 L. 96.3 μm , B. 50.6 μm , and I. 26.4 μm . This species is similar to *C. striolatum* var. *nordstedti*. However, it differs from the latter in having a different size of a cell, an acute shaped sinus, and conical granules that covered all the face of a semicell. St. 1. Europe, Greenland. New to Thailand.
87. *C. prominens* Turner Pl.18, f.19.
 Krieger & Gerloff 1965, Gatt. Cosm. 2, 220, Pl.40, f.18.
 L. 11 μm , B. 10.5 μm , and I. 2.5 μm . Cells minute, slightly broader than the length, deeply constricted at the middle, sinus closed; side view of a semicell circular with a papilla on each side; vertical view elliptic with a papilla on each side of semicell. St. 35. India. New to Thailand.
88. *C. pseudamoenum* Wille Pl.18, f.28.
 West 1911, 4, 31, Pl.102, f.7–9; Förster 1982, 242, Pl.29, f.9.
 L. 62 μm , B. 26.4 μm , and I. 17.6 μm . Sts. 25,28,30. Japan, Europe, N. & S.America, Africa. New to Thailand.
89. *C. pseudarctoum* Nordst.
 West 1908, 3, 32, Pl.68, f.12–14, Pl.72, f.40,41; Förster 1982, 242, Pl.19, f.7–13.
 L. 13.2 μm , B. 9.7 μm , and I. 8.5 μm . Sts. 36,49. Japan, Thailand, Europe, Spitz-

bergen, Greenland.

90. *C. pseudobroomei* Wille Pl.21, f.9.
 West 1911, 4, 22, Pl.100, f.7,8.
 L. 31–42.7 μm , B. 31–35 μm , and I. 9–11 μm . St. 43. New to Thailand. Cosmo-
 politan.
91. *C. pseudoconnatum* Nordst. var. *pseudoconnatum* Pl.13, f.4.
 Krieger & Gerloff 1969, 3–4, 330, Pl.53, f.2; Förster 1982, 243, Pl.19, f.4–5.
 L. 42–61 μm , B. 34–40 μm , and I. 32–37 μm . Cells very slightly constricted at
 the middle, apex slightly convex, non-flattened. This species is distinguished from *C.*
connatum by the retuseness of sinus and is also distinguished from *C. alpestre* by the
 small size of a cell. Sts. 1,51. Cosmopolitan. New to Thailand.
- 91a. var. *attenuatum* Förster
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 331, Pl.71, f.10.
 L. 97 μm , B. 48.5 μm , and I. 47 μm . St. 47. Brazil. New to Thailand.
- 91b. var. *subconstrictum* Jao
 Krieger & Gerloff 1969, 3–4, 332, Pl.71, f.11.
 L. 80 μm , B. 48.5 μm , and I. 47 μm . St. 10. China, Malaysia.
92. *C. pseudocoronatum* Turner
 Turner 1892, K. Sv. Vet. Akad. Handl. 25, 58, Pl.8, f.45.
 L. 46 μm , B. 44 μm , and I. 6.5 μm . Cells of medium size, deeply constricted, sinus
 narrowly linear; semicells subrectangular, apex straight, lateral margin convex and con-
 vergent; cell wall with radial series of small granules within the margin, gradually dimi-
 nished in number and irregularly distributed toward the center. St. 11. India. New to
 Malaysia.
93. *C. pseudoexiguum* Racib. Pl.16, f.18.
 West 1908, 3, 65, Pl.70, f.25,26; Scott & Prescott 1961, 66, Pl.32, f.8.
 L. 17.6 μm , B. 10 μm , and I. 3.5 μm . Sts. 36,40. Ceylon, Indonesia (Sumatra),
 Japan, Europe. New to Thailand.
94. *C. pseudoprotuberans* Kirchn. var. *pseudoprotuberans*
 West 1908, 3, 82, Pl.72, f.6–8; Förster 1982, 246, Pl.20, f.12.
 L. 22–31 μm , B. 15.4–25.5 μm , and I. 4.4–6.5 μm . Sts. 25,49. India, Japan,
 Europe, U.S.A., Africa. New to Thailand.
- 94a. var. *kossinskajae* Krieger & Gerloff Pl.18, f.18.
 Krieger & Gerloff 1965, Gatt. Cosm. 2, 232, Pl.41, f.11.
 L. 9.7 μm , B. 8.8 μm , and I. 3.5 μm . Cells minute, a little longer than the breadth,
 constriction not so deep, sinus open and acute; semicells reniform-subhexagonal, each
 angle acute, apex straight, upper lateral margin shorter than the lower; vertical view of a
 semicell elliptic with central inflation. St. 26. Japan, Europe, Alaska. New to Thailand.

95. *C. pseudopyramidatum* Lund. var. *pseudopyramidatum* Pl.13, f.7; Pl.15, f.13.
West 1905, 2, 201, Pl.64, f.9–12; Förster 1982, 247, Pl.22, f.11–12.
L. 51–60 μm , B. 24–28.5 μm , and I. 10–13 μm . Sts. 1,2,40,41,49. Cosmopolitan.
- 95a. var. *abruptum* Krieger & Gerloff Pl.16, f.14; Pl.18, f.23.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 125, Pl.26, f.2.
L. 29–30 μm , B. 17–18 μm , I. 5.3–6.5 μm . St. 40. Africa, Australia.
- 95b. var. *carniolicum* Lütken. Pl.15, f.14.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 126, Pl.26, f.5.
L. 55–58 μm , B. 35–36.5 μm , I. 10–13 μm . Cells 1.3 times longer than the breadth, constriction deep and sinus narrowly linear; semicells truncate-pyramidal, apex almost straight or slightly convex, apical angles rounded, lateral margin slightly re-tuse. Sts. 17,49. Japan, Europe. New to Thailand.
- 95c. var. *excavatum* Nordst. Pl.16, f.1.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 127, Pl.26, f.7.
L. 97 μm , B. 39.6 μm , I. 20 μm , St. 53. New Zealand. New to Thailand.
- 95d. var. *extensum* (Nordst.) Krieger & Gerloff
Krieger & Gerloff 1965, Gatt. Cosm. 2, 127, Pl.26, f.8.
L. 77 μm , B. 39.5 μm , I. 8 μm . Cells approximately twice as long as the breadth, deeply constricted, sinus narrowly linear; semicells truncate-pyramidal, apex slightly convex, apical angles broadly rounded. St. 53. Europe, Brazil, New Zealand. New to Thailand.
- 95e. var. *lentiferum* Taylor
Krieger & Gerloff 1965, Gatt. Cosm. 2, 128, Pl.26, f.9.
L. 57 μm , B. 37.5 μm , I. 13 μm . St. 3. Europe, Canada. New to Thailand.
- 95f. var. *oculatum* Krieger Pl.17, f.28
Krieger 1932, Arch. Hydrobiol. Suppl. 11, 183, Pl.9, f.23; Scott & Prescott 1961, Hydrobiol. 17, 67, Pl.27, f.2,3.
L. 48.5 μm , B. 31 μm , I. 8–9 μm . St. 53. Indonesia (Sumatra), Philippines, Brazil. New to Thailand.
- 95g. var. *rotundatum* Krieger & Gerloff
Krieger & Gerloff 1965, Gatt. Cosm. 2, 129, Pl.27, f.3.
L. 37.5 μm , B. 22 μm , I. 6.5 μm . Sts. 3,39. Indonesia (Java, Sumatra, Bali), Philippines, Africa. New to Thailand.
96. *C. pseudorectangulare* Grönblad Pl.17, f.2.
Krieger & Gerloff 1965, 237, Pl.42, f.4; Prescott et al. 246, Pl.218, f.5.
L. 23–24 μm , B. 17.6 μm , I. 4–5 μm . Semicells somewhat reniform, upper and lower lateral margins slightly convex, apex slightly straight and narrow, sinus closed; side view of a semicell circular; vertical view elliptic. The specimens examined are slightly similar to the European form. Sts. 2,51, Europe, U.S.A. New to Thailand.

97. *C. pseudotaxichondrum* Nordst. var. *siamense* W. & G.S.West Pl.14, f.4.
W. & G.S.West 1901, Bot. Tidsskr. 24, 173, Pl.3, f.26; Scott & Prescott 1961, Hydrobiol. 17, 67, Pl.31, f.12.
L. 35 μm , B. 35 μm , I. 9.6 μm . Sts. 36,47. Indonesia (Java), Thailand.
98. *C. punctulatum* Bréb. var. *subpunctulatum* (Nordst.) Börges.
West 1908, 3, 209, Pl.85, f.1–3; Förster 1982, 251, Pl.30, f.16,17; Pl. 38, f.10–13.
L. 23–31 μm , B. 19.5–30 μm , I. 6.5–11 μm . Sts. 36,39,47. Cosmopolitan.
99. *C. pyramidatum* Bréb. Pl.14, f.2.
West 1905, 2, 199, Pl.64, f.5–7; Scott & prescott 1961, 67, Pl.27, f.1; Förster 1982, 253, Pl.22, f.1.
L. 66–97 μm , B. 40–57 μm , I. 17.6–20 μm . Sts. 1,2,26,39,40,41. India, Ceylon, Indonesia (Borneo), Europe, U.S.A., Africa.
100. *C. quadratum* Ralfs Pl.18, f.1; Pl.19, f.2.
West 1908, 3, 57, Pl.70, f.6–8; Förster 1982, 255, Pl.24, f.17–19.
L. 70–72 μm , B. 40–52 μm , I. 13–20 μm . Sts. 1,3,38,39,41. Cosmopolitan.
101. *C. quadrum* Lund. var. *quadrum*
West 1911, 4, 20, Pl.100, f.3–6; Förster 1982, 258, Pl.31, f.2.
L. 55–66 μm , B. 53–57 μm , I. 15.4–22 μm . Semicells rectangular, lateral margin slightly convergent, apex straight, apical angles rounded; cell wall with granules disposed in vertical and oblique series. Sts. 4,10,25,31,51. India, Indonesia (Sumatra), Europe, Africa. New to Thailand.
- 101a. var. *minus* Nordst. Pl.20, f.3.
West 1911, 4, 21; Förster 1982, 253.
L. 35–37 μm , B. 32–37.5 μm , I. 9.6–11 μm . Cells approximately as long as the breadth, sinus deep and narrow; semicells subrectangular, apex straight, apical angles broadly rounded, lateral margin convex; cell wall granulate, granules small, disposed in vertical and oblique series. Sts. 25,31. Europe. New to Thailand.
- 101b. var. *sublatum* (Nordst.) W. & G.S.West Pl.21, f.6.
West 1911, 4,21, Pl.100, f.2; Förster 1982, 259, Pl.31, f.3.
L. 53–68 μm , B. 57–65 μm , I. 17.6–20 μm . Cells approximately as long as the breadth or a little longer; semicells transversely rectangular, apex straight, lateral margin convex and convergent upward; cell wall covered with granules disposed in vertical and somewhat radial series near the margin. St. 12,19. Europe, New Zealand. New to Thailand.
102. *C. quadratum* (Gay) De Toni var. *quadratum* Pl.16, f.16; Pl.18, f.20.
West 1908, 3, 121, Pl.72, f.33; Pl.93, f.4; Förster 1982, 254, Pl.24, f.12.
L. 11–13 μm , B. 9–11.5 μm , I. 3.5–4.5 μm . Sts. 10,32,37,51. Europe, Australia. New to Thailand.
- 102a. var. *boldtii* (Messik.) Krieger & Gerloff

- Krieger & Gerloff 1965, Gatt. Cosm. 2, 190, Pl.37, f.11.
L. 11 μm , B. 11 μm , I. 3 μm . St. 26. Europe. New to Thailand.
103. *C. quadrifarium* Lund. var. *hexastichum* (Lund.) Förster
Förster 1982, 257, Pl.39, f.10.
L. 44 μm , B. 35 μm , I. 13 μm . Sts. 1,2,36,39,40. Japan, Europe, Australia, New Zealand.
104. *C. quinarium* Lund.
West 1908, 3, 216, Pl.85, f.9,10; Förster 1982, 259, Pl.29, f.4.
L. 38 μm , B. 32 μm , I. 8.5 μm . St. 32. Japan, Europe, S.America. New to Thailand.
105. *C. refringens* Taylor var. *minus* Irénée
Prescott et al. 1981, 2:3, 272, Pl.180, f.6; Pl.219, f.17.
L. 29 μm , B. 20 μm , I. 4.5 μm . St. 32. N.America. New to Thailand.
106. *C. regnellii* Wille var. *regnellii* Pl.16, f.22.
West 1908, 3, 89, Pl.72, f.25–28.
L. 17.6 μm , B. 16.3 μm , I. 4.4 μm . Cells small, a little longer than the breadth, constriction deep and narrowly linear, lateral margins of semicell somewhat produced, lower and upper lateral margins slightly retuse, apex straight. St. 12. India, Ceylon, Europe, N. & S.America. New to Thailand.
- 106a. f. *catenatum* Krieger Pl.9, f.12.
Krieger 1932, 184, Pl.25, f.5; Scott & Prescott 1961, 68, Pl.32, f.13; Pl.71, f.9.
L. 15.4–17.6 μm , B. 13–16 μm , I. 2.5–4.5 μm . Sts. 35,40. Indonesia (Sumatra). New to Thailand.
- 106b. var. *pseudoregnellii* (Messik) Krieger & Gerloff Pl.17, f.21.
Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 247, Pl.43, f.6.
L. 24 μm , B. 20.7 μm , I. 5.3 μm . Cells small, a little longer than the breadth, constriction deep and sinus narrowly linear; semicells subrectangular, apex slightly retuse at the middle, lateral margin with 3 undulations including apical and basal angles, central undulation somewhat produced. Sts. 11,19. Europe. New to Malaysia and Thailand.
- 106c. var. *rectangulare* Duce. Pl.17, f.21.
Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 247, Pl.43, f.7.
L. 17.6 μm , B. 13 μm , I. 4.4 μm . St. 1. Europe. New to Thailand.
107. *C. regnesii* Reinsch var. *polonicum* (Eich. & Gutw.) Compère Pl.18, f.13.
Förster 1982, 262, Pl.26, f.14,15.
L. 14 μm , B. 13 μm , I. 4.4 μm . St. 43. Europe. New to Thailand.
108. *C. regulare* Schmidle
Krieger & Gerloff 1962, Gatt. Cosm. 1, 27, Pl.8, f.15; Förster 1982, 263, Pl.21, f.4,5.
L. 31 μm , B. 28 μm , I. 9 μm . Sts. 1,40,41. Europe. New to Thailand.
109. *C. reniforme* (Ralfs) Arch. Pl.21, f.13.

- West 1908, 3, 157, Pl.79, f.1,2; Pl.82, f.15.
 L. 35 μm , B. 35 μm , I. 10.5 μm . Semicells reniform, apex faintly flattened, lateral margin convergins upward, apical angles broadly rounded; cell wall granulate, granules somewhat vertically disposed. The specimens examined are slightly smaller than the Indonesian forms described by Krieger & Gerloff. St. 43. Cosmopolitan.
110. *C. repandum* Nordst. var. *minus* (W. & G.S.West) Krieger & Gerloff
 Krieger & Gerloff 1965, Gatt. Cosm. 2, 234, Pl.41, f.18.
 L. 15.4 μm , B. 13 μm , I. 3 μm . St. 2. China, Japan, Europe, N. & S.America, Africa. New to Thailand.
111. *C. retusiforme* (Wille) Gutw. var. *retusiforme* Pl.17, f.19.
 Scott & Prescott 1961, 68, Pl.32, f.15.
 L. 20.7 μm , B. 13 μm , I. 4.4 μm . St. 16. Indonesia (Java). New to Thailand.
- 111a. var. *incrassatum* Gutw.
 Prescott et al. 1981, 2:3, 279, Pl.219, f.12,15.
 L. 66 μm , B. 42 μm , I. 19 μm . Cells subhexagonal, deeply constricted, sinus narrow, lateral margin of semicell slightly convex and rounded, upper lateral margin longer than the lower and non-retuse, lower margin rounded, apex narrow and slightly rounded. The specimens examined are similar to *C. pseudorectangulare*. However the lower lateral margin of this var. *incrassatum* is longer than that of the latter with a short convex lateral margin. Skuja repoted this variety from Burma. St. 3. Europe, N. & S.America.
112. *C. scabrum* Turner Pl.19, f.5.
 Turner 1892, K.Sv.Vet.Akad.Handl. 25, 90, Pl.9, f.32; Scott & Prescott 1961, 68, Pl.29, f.3.
 L. 50.6 μm , B. 53 μm , I. 11 μm . St. 25. India, Indonesia (Sumatra). New to Thailand.
113. *C. sexangulare* Lund. var. *sexangulare* Pl.16, f.3.
 West 1908, 3, 81, Pl.72, f.3; Krieger & Gerloff 1965, Gatt. Cosm.2, 239, Pl.42, f.10.
 L. 35–39.6 μm , B. 28–29 μm , I. 9 μm . Sts. 2,10,26,51. Cosmopolitan.
- 113a. var. *minus* Roy & Bisset Pl.17, f.20.
 Roy & Bisset 1886, Jour. Bot. 24, 195; Krieger & Gerloff 1965, 2, 240, Pl.42, f.12; Prescott et al. 1981, 2:3, 284, Pl.220, f.9,10.
 L. 8 μm , B. 5.7–8 μm , I. 2.2 μm . Sts. 23,50. Indonesia (Java, Sumatra, Celebes), Japan, Europe, N.America, Africa, New Zealand. New to Thailand.
- 113b. var. *rotundatum* Grönblad Pl.18, f.16.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 241, Pl.42, f.13.
 L. 23.3 μm , B. 15.8 μm , I. 13 μm . Semicells octagonal, each angle obtuse, apex straight. St. 47. Europe. New to Thailand.
114. *C. speciosum* Lund. var. *simplex* Nordst. Pl.21, f.12.

- West 1908, 3, 250, Pl.89, f.6; Prescott et al. 2:3, 290, Pl.273, f.7.
L. 25.5 μm , B. 24.6 μm , I. 11–13 μm . Sts. 11,47. Europe. New to Malaysia and Thailand.
115. *C. spinuliferum* W. & G.S.West Pl.20, f.11.
West 1902, Trans. Linn. Soc. Bot. 6, 173, Pl.21, f.12,13; Scott & Prescott 1961, Hydrobiol. 17, 69, Pl.29, f.6,7; Prescott et al.1981, 2:3, 292, Pl.261, f.1.
L. 35 μm , B. 33 μm , I. 10 μm . Cells moderate in size, deeply constricted, sinus narrowly linear; semicells trapeziform, lateral margin convex and convergent upward, apex straight, apical angles broadly rounded; cell wall with a series of marginal granules and 2 or 3 series of granules within the margin, about 3 series of a pair of large granules in the centre of a semicell, with a horizontal series of small granules just above the isthmus. St. 23. Ceylon, U.S.A., Africa. New to Thailand.
116. *C. stigmatosum* (Nordst.) Krieger Pl.17, f.32.
Krieger 1932, Arch. Hydrobiol. Suppl. 11, 186, Pl.10, f.19; Krieger & Gerloff 1965, Gatt. Cosm. 2, 169, Pl.35, f.1.
L. 24–39 μm , B. 20–33 μm , and I. 6.5–11 μm . Cells of medium size, deeply constricted, sinus narrowly linear; semicells trapeziform or truncate-pyramidal, apex flattened, lateral margins converging upward, basal and apical angles rounded. Sts. 32,44,47. Indonesia (Sumatra, Java), Japan. New to Thailand.
117. *C. striolatum* Næg. var. *nordstedtii* (Möbius) Krieger Pl.20, f.1.
Krieger 1932, Arch. Hydrobiol. Suppl. 11, 186, Pl.12, f.2.
L. 123–139 μm , B. 84–88 μm , and I. 57–82 μm . Sts. 1,26,36,39,41,47,49. Indonesia (Borneo, Sumatra). New to Thailand.
118. *C. subauriculatum* W. & G.S. West var. *truncatum* W. & G.S.West Pl.16, f.5.
Scott & Prescott 1961, Hydrobiol. 17, 70, Pl.26, f.5.
L. 44–46 μm , B. 44–52.5 μm , and I. 17.5–22 μm . Sts. 16,21,49,53. Indonesia (Sumatra, Borneo). New to Thailand.
119. *C. subcostatum* Nordst. var. *minus* (W. & G.S.West) Förster Pl.20, f.15.
Förster 1982, 272, Pl.37, f.5.
L. 23–26.4 μm , B. 19–24 μm , and I. 6.5–7 μm . Semicells rounded trapeziform, lateral margin convex-crenate, upper two crenations larger than those the lower which become undulations, apex with 4-undulations and truncate; side view of a semicell circular and with papillar projections. Sts. 2,13,18,25,26. Indonesia (Java), Africa. New to Thailand.
120. *C. subcrenatum* Hantsch. Pl.20, f.13.
West 1908, 3, 228, Pl.86, f.10–14; Förster 1982, 272, Pl.36, f.12.
L. 31–44 μm , B. 26.5–42 μm , and I. 10 μm . Sts. 13,16. Cosmopolitan.
121. *C. subcucumis* Schmidle Pl.16, f.7,21.
West 1905, 2, 155, Pl.60, f.1–3; Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 284,

- Pl.46, f.7; Pl.47, f.1.
L. 46–79 μm , B. 26–44 μm , and I. 13–16 μm . St. 41. Cosmopolitan.
122. *C. subgranatum* (Nordst.) Lütkem. var. *borgei* Krieger & Gerloff Pl.18, f.21.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 139, Pl.29, f.11.
L. 21 μm , B. 13 μm , and I. 4.4 μm . Europe. New to Thailand. St. 26.
123. *C. subprotumidum* Nordst.
West 1908, 3, 231, Pl.86, f.19–21; Förster 1982, 274, Pl.37, f.11.
L. 29 μm , B. 26.4 μm , and I. 7 μm . Cells of submedium size, with a deep constriction, sinus narrowly linear; semicells trapeziform, truncate apex, apical undulation shallow, intramarginal granules disposed in a pair but diminishing toward the centre, with the vertical series of granules disposed in the centre above the isthmus. St. 11. Indonesia (Sumatra), Nepal, China, Japan, Europe. New to Thailand.
124. *C. subspeciosum* Nordst.
West 1908, 3, 252, Pl.89, f.11; Förster 1982, 276, Pl.38, f.2.
L. 44 μm , B. 33 μm , and I. 11 μm . Cells of medium size, 1.3 times longer than the breadth, sinus deep and narrowly linear; semicells crenate-trapeziform, apex with 4 crenae, lateral margin convex and with 5 crenae, each emarginate crenae like a binate from central part of a semicell with a vertical series of costae (5-costae). St. 53. Asia, Europe, N.America, Africa.
125. *C. subtumidum* Nordst. var. *subtumidum* Pl.14, f.9.
West 1905, 2, 192, Pl.63, f.18–20; Krieger & Gerloff 1965, Gatt. Cosm. 2, 162, Pl.33, f.17.
L. 27–29 μm , B. 23–28.5 μm , and I. 8.5 μm . Sts. 1,40. Europe, Brazil, Africa, Australia.
- 125a. var. *rotundum* Hirano
Hirano 1951, Acta Phytotax. Geobot. 14, 70, f.2; Prescott et al. 1981, 2:3, 316, Pl.187, f.11,12.
L. 26.4 μm , B. 16 μm , and I. 5.3 μm . St. 40. Japan. New to Thailand.
126. *C. sumatranum* Krieger var. *sumatranum*
Krieger 1932, Arch. Hydrobiol. Suppl. 11, 188, Pl.11, f.2.
L. 31 μm , B. 26.5 μm , and I. 8 μm . Cells of medium size, deeply constricted, sinus narrowly linear but a little acutely dilated in some specimens; semicells trapeziform, apex straight or faintly retuse, lateral margins convex and convergent, apical angles broadly rounded; cell wall furnished with sparsely and radial series of small granules, series diminished in the inner series, centre smooth. St. 45. Indonesia (Java, Sumatra). New to Thailand.
- 126a. var. *nepalense* Förster Pl.21, f.11.
Förster 1982, 279, Pl.30, f.11,12.
L. 17.6–22 μm , B. 13–17.6 μm , I. 6–6.5 μm . Cells small, as long as the breadth,

deeply constricted, sinus narrowly linear; semicells trapeziform, apex scarcely flattened, apical angles broadly rounded, basal angles rounded; vertical view of a semicell oblong rhomboidal; cell wall covered with small granules, somewhat disposed in transversal series, central part of a semicell irregular. The specimens examined from Thailand are closely similar to *C. ozense* Hirano. Sts. 18,27. Nepal, Cambodia. New to Thailand.

127. *C. taticum* Racib. var. *groenbladii* Krieger & Gerloff Pl.16, f.17.
 Krieger & Gerloff 1965, Gatt. Cosm. 2, 181, Pl.36, f.17.
 L. 46 μm , B. 24 μm , I. 13 μm . St. 40. Europe. New to Thailand.

128. *C. tenue* Arch. var. *depressum* Irénée-Marie Pl.18, f.6.
 Prescott et al. 1981, 2:3, 324, Pl.173, f.23.
 L. 16.7 μm , B. 13 μm , I. 2.2 μm . Cells approximately as long as the breadth, deeply constricted, sinus narrowly linear, apex of semicell straight, lateral margin convex and convergent upward. This variety resembles *C. minutissima* var. *depressum*. However the size of *C. tenue* var. *depressum* is slightly larger than the latter. St. 47. N.America. New to Thailand.

129. *C. thailandicum* Hirano, sp. nov. Pl.21, f.10.
 Cellulae submediocres, 1.4 plo longiores quam latiores, profunde constrictae, sinu acuto et aperto; semicellulae ellipticae, apice recto, membrana cum granulis magnis transverse ornata; semicellulae in latere visae circulares, granulis transverse ornatae; et in vertice visae ellipticae, granulis magnis transverse ornatae. Long. 31 μm , lat. 22 μm , lat. isthm. 6.5 μm . St.40.
 Type: Pl.21, f.10. Loc. Phu Kradung, Thailand.
 Cells medium size, approximately 1.4 times longer than the breadth, deeply constricted, sinus acutely open; semicells elliptical, apex slightly flattened, cell wall furnished with 3 series of granules, granules fairly large, transversely arranged; side view of a semicell circular, with the transverse series of granules; vertical view of a semicell elliptic, furnished with granules. L.31 μm , B.22 μm , I.6.5 μm . St. 40.

130. *C. thwaitesii* Ralfs var. *thwaitesii* Pl.9, f.10.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 346, Pl.56, f.1.
 L. 41 μm , B. 22 μm , and I. 20.5 μm . St. 20. Europe, Africa, New Zealand. New to Thailand.

- 130a. var. *penioides* Klebs
 Prescott et al. 1981, 2:3, 328, Pl.170, f.12–14.
 L. 52 μm , B. 24 μm , and I. 23 μm . Sts. 35,36. Asia, Europe, U.S.A. New to Thailand.

131. *C. tithophorum* Nordst. var. *tithophorum* Pl.17, f.17.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 320, Pl.50, f.3; Prescott et al. 1981, 2:3, 329, Pl.175, f.13,14.
 L. 22–23 μm , B. 22 μm , and I. 5.7–6.5 μm . St. 32. Indonesia (Java), Burma, Europe, U.S.A., Africa.

- 131a. var. *depressum* W. & G.S.West Pl.15, f.18.
 Krieger & Gerloff 1969, Gatt. Cosm. 3–4, 320, Pl.50, f.4.
 L. 24 μm , B. 24 μm , and I. 4–6.5 μm . St. 23. Ceylon, Japan, Africa.
132. *C. tjibonogense* Gutw. forma *minus* G.S.West Pl.16, f.11.
 Scott & Prescott 1961, Hydrobiol. 17, 72, Pl.27, f.8.
 L. 32–39.6 μm , B. 18–20 μm , and I. 4.5–6.5 μm . Cells deeply constricted, sinus widely open and rounded at the extremity, isthmus somewhat elongated; semicells reniform-hexagonal, apical angles well rounded, lower lateral margin slightly longer than the upper, apex slightly flattened. Sts. 25,30,47,51. Indonesia (Sumatra). New to Thailand.
133. *C. torquetum* (Turner) Hirano, comb. nov. Pl.21, f.7.
Xanthidium torquatum Turner 1892, K.Sv.Vet.Akad.Handl. 25, 102, Pl.22, f.8.
 L. 48.5–54 μm , B. 48.5 μm , and I. 11–13 μm . Sts. 1,19,23,36,38,40. India. New to Thailand.
134. *C. trachypleurum* Lund. var. *nordstedtii* Gutw. Pl.20, f.9.
 Krieger 1932, Arch. Hydrobiol. Suppl. 11, 188, Pl.11, f.11.
 L. 24 μm , B. 20.6 μm , and I. 6.2 μm . The specimens examined are slightly smaller than the form described by Krieger. Semicells trapeziform, apex truncate and straight, furnished with granules in an irregular disposition. St. 53. Indonesia (Java, Sumatra). New to Thailand.
135. *C. transitorium* (Heimerl) Ducell.
 Prescott et al. 1981, 2:3, 331, Pl.163, f.1–3.
 L. 61.6 μm , B. 44 μm , I. 15 μm . St. 2. Europe, U.S.A., Australia. New to Thailand.
136. *C. trilobulatum* Reinsch Pl.16, f.15.
 Prescott et al. 1981, 2:3, 331, Pl.183, f.11–13, Pl.221, f.8.
 L. 17.6 μm , B. 12.3–13.2 μm , I. 4.4 μm . Sts. 30,32, Cosmopolitan. New to Thailand.
137. *C. tumidum* Lund. var. *tumidum* Pl.17, f.9.
 West 1905, 2, 160, Pl.60, f.18; Förster 1982, 287, Pl.21, f.6.
 L. 22–27.3 μm , B. 17.6–22 μm , I. 4.5–6.5 μm . Sts. 1,49. Cosmopolitan. New to Thailand.
- 137a. var. *subtile* Kirchn. Pl.16, f.26.
 Prescott et al. 1981, 2:3, 337, Pl.172, f.7–9.
 L. 30.8 μm , B. 19 μm , I. 5.3 μm . St. 32. Europe, U.S.A. New to Thailand.
138. *C. undulatum* Corda var. *minutum* Wittr. Pl.15, f.10; Pl.17, f.29; Pl.34, f.8.
 Prescott et al. 1981, 2:3, 341, Pl.167, f.7–9.
 L. 33 μm , B. 25 μm , I. 8 μm . Sts. 10,34,36. China, Europe, S.America, Africa.
139. *C. urceum* W. & G.S.West Pl.17, f.5.

- Krieger & Gerloff 1965, Gatt. Cosm. 2, 176, Pl.36, f.7.
L. 28.5 μm , B. 13 μm , I. 4.5 μm . Apex of semicell flattened or slightly convex. St. 16. Singapore, Japan. New to Thailand.
140. *C. vanum* Gutw. Pl.17, f.31.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 172, Pl.35, f.10.
L. 31 μm , B. 24 μm , I. 6.5 μm . Cells deeply constricted, sinus acuminate at the extremity, outer part open; semicells broadly ovate, lateral angles broadly rounded, apex faintly flattened, St. 39. Europe.
141. *C. variolatum* Lund. var. *variolatum* Pl.13, f.11.
West 1905, 2, 203, Pl.64, f.14–16; Krieger & Gerloff 1965, Gatt. Cosm. 2, 117, Pl.24, f.12; Förster 1982, 290, Pl.22, f.13.
L. 35 μm , B. 20 μm , I. 6.5 μm . St. 1. Indonesia (Sumatra), Ceylon, Europe, U.S.A., Brazil.
- 141a. var. *foraminum* Hirano Pl.13, f.5.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 118, Pl.24, f.14.
L. 22 μm , B. 16 μm , I. 4.5 μm . St. 40. Japan. New to Thailand.
- 141b. var. *polygonum* Krieger & Gerloff Pl.16, f.24.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 118, Pl.24, f.15.
L. 24–25 μm , B. 13–15 μm , I. 5–6.5 μm . Cells smaller in size than those of the typical form; semicells truncate-pyramidal, lateral margin convex, apex truncate and straight. Sts. 38,39. Europe. New to Thailand.
- 141c. var. *rotundatum* (Krieger) Messik. Pl.17, f.25.
Förster 1982, 291, Pl.22, f.14.
L. 31–39.5 μm , B. 22–26.4 μm , I. 6.5–8.8 μm . Sts. 1,15,36,39. Indonesia (Sumatra), China, Europe, Brazil, Africa.
142. *C. varsoviense* Racib. var. *latum* (Grönblad) Krieger & Gerloff Pl.14, f.8; Pl.20, f.12.
Krieger & Gerloff 1965, Gatt. Cosm. 2, 173, Pl.35, f.14.
L. 40–41 μm , B. 35–38 μm , I. 11–19 μm . Cells approximately as long as the breadth, sinus narrowly linear, apex of a semicell flattened, lateral margin convex, lower margin broadly rounded, centre of a semicell with a group of scrobiculations. Sts. 21,23. Europe. New to Thailand.
143. *C. vitiosum* Scott & Grönblad var. *vitiosum*
Prescott et al. 1981, 2:3, 349, Pl.277, f.1–5.
L. 35–37 μm , B. 26.4–28.6 μm , I. 8–8.6 μm . Cells of a little less than medium size, constriction deep and sinus narrowly linear; semicells truncate-pyramidal, apex truncate, straight or slightly convex, lateral margin convex and convergent, with short spines along the margin and similar spines irregularly disposed, 4 granules just below the apex. 3–5 scrobiculations irregularly disposed in the centre. Sts. 12,47. U.S.A., Africa. New to Thailand.

- 143a. var. *orientale* Scott & Prescott Pl.20, f.14.
 Scott & Prescott 1961, Hydrobiol. 17, 73, Pl.31, f.1,2.
 L. 31 μm , B. 24 μm , I. 6.5 μm . Cells 1.5 times longer than the breadth, deeply constricted, sinus narrowly linear; semicells trapeziform, apex straight or slightly convex, lateral margin slightly convex and furnished with short spines equidistantly disposed, with the intermarginal spines irregularly disposed, 3–5 scrobiculations disposed in the centre of the semicell. This variety is distinguished from the typical form by the sharp marginal spines and the central scrobiculations. St. 49. Indonesia (Java, Sumatra). New to Thailand.
144. *C. zonatum* Lund. var. *zonatum* Pl.18, f.32.
 West 1908, 3, 123, Pl.77, f.20,21; Förster 1982, 296, Pl.25, f.1.
 L. 44 μm , B. 22 μm , I. 12.3 μm . St. 31. Ceylon, Indonesia (Sumatra), Japan, Europe, U.S.A., Africa. New to Thailand.
- 144a. var. *subcirculare* Scott & Grönblad f. *cylindricum* Scott & Grönblad Pl.17, f.27.
 Prescott et al. 1981, 2:3, 352, Pl.200, f.5.
 L. 61.5 μm , B. 22–28.6 μm , I. 5–11 μm . Sts. 1,35. U.S.A. New to Thailand.
1. *Euastrum acanthophorum* Turner Pl.30, f.3,4.
 Turner 1892, K.Sv.Vet.Akad.Handl. 25, 82, Pl.10, f.53; Krieger 1932, Arch. Hydrobiol. Suppl. 11, 210, Pl.20, f.6; Scott & Prescott 1961, Hydrobiol. 17, 22, Pl.13, f.4,5.
 L. 33–35 μm , B. 23–26.5 μm , and I. 5.3–7.5 μm . Sts. 36,39,40,41. India, Indonesia (Sumatra, Borneo). New to Thailand.
2. *E. ansatum* Ehrenb. var. *ansatum* Pl.22, f.3–5.
 West 1905, 2, 27, Pl.36, f.10–13; Krieger 1937, Krypt. Flora 13:1, 484, Pl.58, f.1–3; Förster 1982, 310, Pl.43, f.4.
 L. 92–106 μm , B. 39–48.5 μm , and I. 11–15 μm . Sts. 12,18,19,26,32. India, Ceylon, Burma, Thailand, Indonesia (Java, Sumatra), Singapore, and Others.
- 2a. var. *dideltiforme* Ducell. Pl.22, f.7
 Krieger 1937, 13:1, 488, Pl.58, f.8; Förster 1982, 311, Pl.43, f.5.
 L. 90 μm , B. 44 μm , and I. 13 μm . Cells fairly large, approximately twice longer than the breadth; semicells 5-lobed, incision between polar and lateral lobes broadly concave, polar lobe somewhat elongate, lateral lobes divided into two parts by the re-tuse margin, semicell with a distinct pore at the middle; cell wall with vertical series of punctations in the upper part but irregular in the lower part. Sts. 19,20,31. Europe, N.America.
- 2b. var. *pyxidatum* Delp. Pl.22, f.6.
 West 1905, 2, 29, Pl.36, f.14,15; Krieger 1937, 489, Pl.58, f.7; Förster 1982, 311, Pl.43, f.6.
 L. 64–68 μm , B. 33 μm , and I. 9–11 μm . Sts. 25,30,43,44. India, Indonesia (Sumatra), Cambodia, Japan, China, Europe, Africa.

2c. *var. undulatum* Hirano, *var. nov.*

Pl.23, f.1.

Cellulae mediocres, circiter 2.5 plo longiores quam latae, profunde constrictae ad medium, sinu angusto-lineari; semicellulae subpyramidatae, marginibus lateralibus 4-undulatis, inter lobos polares et laterales retusis, lobis polaribus subpyramidatis, apice convexo et cum incisionibus apicalibus angusto-lineari, angulis apicalibus late rotundatis, lobis lateralibus rectangularibus. Long. 81.5 μm , lat. 33 μm , lat. isth. 12 μm .

Type: Pl.23, f.1. Loc. Non Boa Saket, Thailand.

Cells of medium size, approximately 2.5 times longer than the breadth, deeply constricted at the middle, sinus closed; semicells subpyramidate, lateral margins with 4-undulations, incision between polar and lateral lobes shallow and retuse, polar lobe pyramidate, apex slightly convex with a deep and closed apical incision. L. 81.5 μm , B. 33 μm , and I. 12 μm . St. 47. Thailand.

3. *E. bidentatum* Näg.

Pl.25, f.13; Pl.26, f.1.

West 1905, 2, 39, Pl.37, f.16–19; Krieger 1937, 601, Pl.85, f.1,2; Förster 1982, 312, Pl.42, f.4–6.

L. 40–47 μm , B. 26.5–33 μm , and I. 5.7–6.5 μm . Sts. 1,10,36,41. Cosmopolitan.

4. *E. bilobum* Lütkem. *var. bilobum*

Pl.30, f.7.

Migula 1907, Krypt. Fl. 2:1, 493, Pl.27c, f.7; Krieger 1937, 597, Pl.82, f.10–12; Hirano 1959, Contr. Biol. Lab. Kyoto Univ. 7, 259, Pl.33, f.22.

L. 26.5 μm , B. 14 μm , and I. 4.5 μm . Cells small, approximately 1.8 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear; semicells semi-elliptic, apical incision deep and linearly open, lateral margins convex with slight 3-undulations; cell wall with a pair of small granules below the apex. St. 31. Japan, Europe. The specimens examined are smaller than the typical form of *E. bilobum* given by Migula and Krieger.

4a. *var. thailandicum* Hirano, *var. nov.*

Pl.36, f.7.

Cellulae hexagonales, circiter 1.4 plo longiores quam latiores, profunde constrictae, sinu angusto-lineari sed ad medium leviter dilatato; semicellulae truncato-pyramidatae, apice cum incisuris medianis profunde lineari-aperto, marginibus lateralibus leviter concavis et paullo undulatis. Long. 44 μm , lat. 31 μm , lat. isth. 8 μm . St. 30.

Type: Pl.36, f.7. Loc. Khao Yai, Thailand.

Cells hexagonal in outline, approximately 1.4 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear but slightly dilated at the middle; semicells truncate-pyramidate, with a deep median incision and linearly open or closed but the outer part open, apical angles broadly rounded, lateral margins slightly concave and delicately undulate in the lower part. St. 30.

5. *E. binale* (Turp.) Ehrenb. *var. hians* W. West

Pl.30, f.12.

West 1905, Brit. Desm. 2, 53, Pl.38, f.33 (forma); Krieger 1937, 13:1, 551, Pl.75, f.16.

L. 12–13 μm , B. 9–10 μm , and I. 3 μm . Sts. 30,35,36,40. Ceylon, Europe, N.America, Africa.

5a. var. *minus* W. West

West 1905, 2,53; Krieger 1937, 552, Pl.75, f.17.

L. 11.4 μm , B. 9.7 μm , and I. 4 μm . St. 1. Europe, U.S.A.

5b. var. *papilliferum* Gutw.

Pl.27, f.4.

Krieger 1937, 553, Pl.75, f.18–20.

L. 26.4 μm , B. 20.7 μm , and I. 4.5 μm . St. 40. Europe. New to Thailand.

6. *E. bipartitum* Krieger

Pl.23, f.14; Pl.27, f.12.

Krieger 1932, Arch. Hydrobiol. Suppl.11, 211, Pl.20, f.16; Krieger 1937, 570, Pl.77, f.28–30.

L. 22–24 μm , B. 17.5–20 μm , and I. 5.7–6.5 μm . Cells small, approximately 1.3 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear and outer part slightly open; semicells 3-lobed, polar lobe transversely rectangular and slightly dilated upward, apical angles with 2–3 minute denticulations, apex widely retuse, lateral lobes rectangular, margin convex with 3 denticulations at and inside the margin, with a ring of 5 granules in the centre of a semicell. Sts. 1,28,35,37. Indonesia (Sumatra). New to Thailand.

7. *E. boldtii* Schmidle

Pl.23, f.4,5.

Krieger 1937, Krypt. Pl. 13:1, 563, Pl.77, f.5–7.

L. 24 μm , B. 20 μm , and I. 5.7 μm . Cells small, approximately 1.3 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear; semicells 3-lobed, polar lobe transversely rectangular, apex retuse at the middle, apical angles with a short spine, side of polar lobe convex, incision between polar and lateral lobes retuse, lower lateral margin convex and divergent. The specimens examined from Thailand are slightly different from the typical form of *E. boldtii*. This species resembles both *E. sibiricum* f. *fennica* and *E. sibiricum* f. *exsecta*. However, it is different from these two forms by the lack of granules or denticulations described by Grönblad 1921 (Pl.3, f.16–19). It is also different from *E. gayanum* by a small size. Sts. 36,39. Europe. New to Thailand.

8. *E. ceylanicum* (W. & G.S. West) Krieger

Pl.25, f.2.

Krieger 1937, Krypt. F1. 13:1, 627, Pl.90, f.16,17; Scott & Prescott 1961, 24, Pl.11, f.3–5; Hirano 1967, Nature and Life Southeast Asia 5, 57.

L. 73.5 μm , B. 66 μm , and I. 13 μm . Cells fairly large, slightly longer than the breadth, sinus narrowly linear; semicells 3-lobed, polar lobe obcuneate, lateral lobes horizontal, polar and lateral lobes furnished with sharp denticulations, central part of a semicell with a cycle of denticulations. St. 24. Ceylon, Indonesia (Sumatra, Borneo), Cambodia, Japan. New to Thailand.

9. *E. crameri* Racib.

Pl.25, f.3.

Krieger 1932, 211, Pl.20, f.12 (forma); Krieger 1937, 620, Pl.90, f.1–3; Ruzicka 1:2, 504, Pl.82, f.20–22.

L. 88 μm , B. 53 μm , and I. 11 μm . St. 26. Europe, Japan. New to Thailand.

10. *E. denticulatum* (Kirchn.) Gay Pl.23, f.3; Pl.26, f.4.
 West 1905, 2, 56, Pl.39, f.1–4; Krieger 1932, 212, Pl.20, f.14. (forma); Krieger 1937, 583, Pl.80, f.15–17; Förster 1982, 318, Pl.41, f.5.
 L. 32–35 μm , B. 23–26.5 μm , and I. 5.2–6.5 μm . Sts. 1,22,29,30,43,44. Cosmopolitan.

11. *E. didelta* Ralfs var. *bengalicum* Lagerh. Pl.23, f.21.
 Krieger 1937, 519, Pl.67, f.4–6; Scott & Prescott 1961, 25, Pl.9, f.5,6; Hirano 1967, Nature and Life Southeast Asia 5, 58, Pl.1, f.5.
 L. 123–132 μm , B. 57–90 μm , and I. 13–17 μm . Cells fairly large, approximately twice longer than the breadth; semicells 5-lobed, polar lobes elongated and somewhat variable in shape, upper lateral lobes fairly developed, lower lateral lobes broadly rounded; cell wall with 2 scrobiculations and disposed vertically. This variety resembles *E. sinuosum* var. *dideltoides*. It is larger in size than the latter. Sts. 18,19,24,44,49. India, Ceylon, Indonesia (Java, Borneo, Sumatra), Singapore, Cambodia. New to Thailand.

12. *E. diplostauron* Skuja Pl.27, f.7.
 Skuja 1949, Nova Acta R. Soc. Sci. Upsal. IV, 14:5, 112, Pl.24, f.1; Hirano 1977, Illustr. Jap. Freshw. Algae 641, Pl.638, f.10 (in Japanese).
 L. 24 μm , B. 28 μm , and I. 6 μm . Cells small, approximately as long as the breadth or a little broader than the length, deeply constricted, sinus open and broadly linear, acute at the extremity; semicells with a straight apex and acute denticulations at the apical angle, lateral lobes horizontal with 3 or 4 denticulations and similar denticulations within the polar and lateral margins, 3 or 4 denticulations in the centre of the semicell just above the isthmus. Sts. 19,20. Burma, Japan. New to Thailand.

13. *E. dubium* Näg. var. *dubium* Pl.26, f.2,3; Pl.28, f.5.
 Krieger 1937, 13:1, 571, Pl.79, f.1–5; Ruzicka 1981, 1:2, 493, Pl.81, f.1–4; Förster 1982, 320, Pl.41, f.1–2.
 L. 26.5–39 μm , B. 16.7–24 μm , and I. 5–9 μm . Sts. 3,17,24,25,32,40,43,49. Indonesia (Sumatra), Europe, U.S.A., Africa. New to Thailand.

- 13a. var. *tropicum* (W. & G. West) Krieger Pl.27, f.6; Pl.30, f.5,6.
 Krieger 1937, 573, Pl.79, f.28,29.
 L. 23 μm , B. 14 μm , and I. 5.3 μm . Smaller in size than that of the var. *dubium*; semicells somewhat pyramidal, 3-lobed, polar lobe rectangular, side lobes somewhat produced, apex with a deep and somewhat linearly open incision, apical angles with a denticulation; cell wall with a group of granules. St. 26. Ceylon, Africa. New to Thailand.

14. *E. elegans* (Bréb.) Kütz. var. *elegans* Pl.26, f.10,11; Pl.30, f.1.
 Krieger 1937, 591, Pl.81, f.14–18; Scott & Prescott 1961, 26, Pl.13, f.17; Förster 1982, 321, Pl.42, f.1–2.
 L. 21–31 μm , B. 13–20.5 μm , and I. 4.5–5.3 μm . Sts. 20,24,47. Burma, Indonesia

(Borneo, Sumatra), Japan, Europe, N.America, Africa. New to Thailand.

- 14a. *var. pseudelegans* (Turner) W. & G.S.West Pl.30, f.2.
 Krieger 1937, 595, Pl.81, f.19; Hirano 1967, Nature Life SE Asia, 5,58.
 L. 32 μm , B. 22 μm , and I. 6.5 μm . St. 31. India, Thailand, Europe, N.America.

15. *E. exile* Joshua *var. exile* Pl.29, f.2,3.
 Joshua 1886, Jour. Linn. Soc. Bot. 21, 640, Pl.23, f.16–18; Krieger 1932, 212, Pl.20, f.11; Krieger 1937, 578, Pl.74, 32–34.
 L. 22–31 μm , B. 13–17 μm , I. 4.5–6 μm . Cells small, 1.7 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear, 3-lobed, polar lobe rectangular, apex straight, non-retuse at the middle, apical angles with a short spine erected upward, side convex, incision between polar and lateral lobes slightly retuse, lateral lobes retuse. Sts. 24,25,26,27,29,40. Burma, Indonesia (Sumatra, Bali). New to Thailand.

- 15a. *var. latum* Hirano, *var. nov.* Pl.51, f.14.
 Cellulae submediocres, profunde constrictae, sinu angusto-lineari; semicellulae trilobatae, lobis polaribus transverse rectangularibus, apice retuso, angulis apicalibus cum spinis minutis divergente productis, marginibus lateralibus convexis; membrana cum scrobiculis irregulariter dispositis, Long. 33 μm , lat. 19.4 μm , lat. isthm. 5.7 μm . Sts. 35,39.
 Type: Pl.51, f.14. Loc. Phu Kvadung, Thailand.
 Cells medium sized, deeply constricted, sinus angusto-linear; semicells trilobe, polar lobe transversely rectangular, apex retuse, apical angles with a minute, diverging spine, lateral margin convex; cell wall with scrobiculations irregularly disposed.

16. *E. fissum* W. & G.S.West Pl.25, f.12.
 West 1902, Trans. Linn. Soc. Bot. 6, 154, Pl.20, f.17; Krieger 1937, 596, Pl.82, f.13,14.
 L. 31 μm , B. 19.6 μm , and I. 6.5 μm . Cells small, 1.8 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear, apical incision of a semicell deep and slightly linearly open, dilated at the extremity; apex broadly rounded, incision between polar and lateral lobes shallow and rounded, lower lateral margin divergent and truncate; cell wall with 3-curved, long granules on the central inflation. Sts. 25,53. Ceylon. New to Thailand.

17. *E. gemmatum* Bréb. *var. tenuis* Krieger
 Krieger 1937, 641, Pl.92, f.12–13; Prescott et al. 2:2, 63, Pl.82, f.7,7a.
 L. 38–42 μm , B. 26–27 μm , and I. 8–9 μm . Sts. 1,36,39,40. Brazil. New to Thailand.

18. *E. gessneri* Krieger & Bourr. *var. laticeps* Scott & Prescott Pl.27, f.8,9.
 Scott & Prescott 1961, Hydrobiol. 17, 27, Pl.14, f.11.
 L. 39–42 μm , B. 31–32 μm , and I. 11–12 μm . Sts. 1,3,40. Indonesia (Borneo, Sumatra). New to Thailand.

19. *E. gnathophorum* W. & G.S.West Pl.24, f.8.
 West 1897, Jour. Linn. Soc. Bot. 33, 160, Pl.9, f.3,4; Krieger 1932, 213, Pl.21, f.6;
 Krieger 1937, 13:1, 508, Pl.63, f.15–17.
 L. 66–79 μm , B. 33–42 μm , and I. 9–13 μm . Sts. 1,24,27,28,36,38,39,40,49.
 Ceylon, Singapore, Indonesia (Sumatra), Japan.

20. *E. horikawae* Hinode Pl.24, f.3,6.
 Hinode 1960, Hikobia 2, 113, f.3:16–18.
 L. 92–95 μm , B. 75–77 μm and I. 22–29 μm . Cells large, 1.5–1.7 times longer
 than the breadth, deeply constricted, sinus narrowly linear; semicells semicircular, 3-
 lobed, incision between polar and lateral lobes fairly deep and open: semicircular and
 rounded at the extremity, lateral lobe slightly larger than that of a polar lobe, lateral
 margin with many crenation, polar lobe divided into 2 parts, median incision of apex ex-
 cavated; semicells with 3-protuberances transversely, each protuberance consists of many
 granules disposed in circular series, but in some specimens granules confined to the out-
 er part and disposed in circular series. Sts. 19,22,24. Indonesia (Sumatra), Japan. New
 to Thailand.

21. *E. indicum* Krieger var. *capitatum* Krieger Pl.23, f.11.
 Krieger 1932, 213, Pl.22, f.5; Krieger 1937, 534, Pl.61, f.10–12; Hirano 1959, Contr.
 Biol. Kyoto Univ.248, Pl.31, f.15.
 L. 62–75.5 μm , B. 31–34 μm , and I. 4–11 μm . Indonesia (Sumatra), Japan. New
 to Thailand.

22. *E. inerme* (Ralfs) Lund. var. *glabrum* Borge Pl.24, f.5.
 Borge 1906, 25, f.1; Krieger 1937, 507, Pl.63, f.27–29.
 L. 40–44 μm , B.23–26.5 μm , and I. 6.5–7.5 μm . Sts. 1,36,40,41. S.America. New
 to Thailand.

23. *E. insulare* (Witttr.) Roy Pl.26, f.13; Pl.27, f.9
 West 1905, 2, 68, Pl.40, f.11–13; Krieger 1937, 555, Pl.76, f.11–14; Förster 1982,
 329, Pl. f.15,16.
 L. 20–21 μm , B. 14–17 μm , and I. 4–5.7 μm . Cells small, 1.5 times longer than
 the breadth, sinus narrowly linear; semicells subrectangular, basal angles rectangular,
 lateral margin retuse at the middle, polar lobe transversely rectangular, apical angle
 slightly rectangularly rounded, apex retuse at the middle. Sts. 26,43. Ceylon, Thailand,
 Europe, U.S.A. Cosmopolitan.

24. *E. intermedium* Cl. in Krieger 1937, 532, Pl.71, f.6–8. Pl.21, f.2.
var. *rotundatum* Hirano, var. nov.
 Var. lobis polaribus et lateralibus bene rotundatis, tumore centrali cum poris singulis,
 incisura mediana semicellularum profunde constricta, sinu acute aperto et acuminato ad
 extremum. Long.70.5–83 μm , lat. 37.5–39.6 μm , lat. isthm. 11–13 μm .
 Type: Pl.21, f.2. Loc. Botanical Garden, Chiangmai, Thailand.
 Cells approximately twice as long as the breadth, deeply constricted at the middle,

sinus open acutely and acuminate at the extremity; semicells 3-lobed, polar and lateral lobes well rounded, incision between polar and lateral lobes broadly concave; cell wall with a pore at the middle of a semicell, other parts punctated. L. 70.5–83 μm , B. 37.5–39.6 μm , and I. 11–13 μm . St. 42. Thailand.

25. *E. invaginatium* Scott & Prescott Pl.26, f.5.
 Prescott et al. 1977, 2:2, 75, Pl.73, f.13,13b.
 L. 39.6 μm , B. 19 μm , and I. 10 μm . St. 39. U.S.A. New to Thailand.

26. *E. irregulare* Maskell Pl.23, f.6; Pl.27, f.11.
 Croasdale & Flint 1986, Fl. New Zealand Desm. 1, 93, Pl.21, f.5.
 L. 26.4–28.6 μm . B. 22 μm , and I. 6.5 μm . Semicells trapeziform, 5-lobed, polar lobe transversely rectangular, apex convex with a median notch, apical angles with a short spine, incision between the polar and lateral lobes shallow concave, upper lateral lobe truncate, lower lobe slightly developed 3-undulation. Sts. 30,36,39,40,41. New Zealand. New to Thailand.

27. *E. jenneri* Arch. Pl.22, f.8; Pl.24, f.4.
 West 1905, 2, 22, Pl.36, f.4; Krieger 1937, 505, Pl.63, f.8; Ruzicka 1:2, 1981, 426, Pl.69, f.13.
 L. 63–84 μm , B. 35–48 μm , and I. 9–13 μm . Cells of medium size, approximately 1.5–1.7 times longer than the breadth, deeply constricted at the middle, sinus closed; semicells 5-lobed, polar lobe elongated and dilated upward like an anvil at the extremity, lateral lobe rectangular and divided into two parts of sublobules, in a form of retuse, with many inflations on a semicell, inflations penetrated by the pore. Sts. 1,24, 28,29,35,36,40,41,45,51. Europe, U.S.A. New to Thailand.

28. *E. lapponicum* Schmidle Pl.26, f.7.
 Krieger 1937, 604, Pl.85, f.8,9; Ruzicka 1981, 1:2, 497, Pl.81, f.10–14.
 L. 48.5 μm , B. 35 μm , and I. 6.5 μm . St. 23. Europe, U.S.A. New to Thailand.

29. *E. longicolle* Nordst. var. *capitatum* W. & G.S.West Pl.21, f.1.
 Krieger 1937, 494, Pl.60, f.11; Scott & Prescott 1961, 29, Pl.8, f.4,5.
 L. 88 μm , B. 37.4 μm , and I. 9.7 μm . Cells fairly large, approximately 2.3 times longer than the breadth, deeply constricted at the middle, sinus deep and narrowly linear; semicells 3-lobed, polar lobe elongate and capitate in the upper part, lower part of lateral margin slender and concave, lateral lobe rectangular, lateral margin divergent and retuse; cell wall with a distinct pore in the centre of a semicell, upper part of a polar lobe with many scrobiculations. St. 29. India, Ceylon, Indonesia (Sumatra). New to Thailand.

30. *E. luetkemuellieri* Ducell. Pl.22, f.9,12.
 Krieger 1932, 32, Pl.14, f.8; Krieger 1937, 560, Pl.80, f.1–4.
 L. 26.4–28 μm , B. 16.5–17 μm , and I. 3.5 μm . Cells small, 1.5 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear; semicells truncate-pyramidal, apex truncate and retuse at the middle, apical angles rounded, lateral mar-

gin slightly retuse in the upper part, basal angles rounded; cell wall smooth and without a middle pore. The shape of semicell of this species is similar to that of *C. pseudopyramidatum* var. *abruptum* Krieger & Gerloff and *C. urceum* West. However, *E. luetke-muelleri* differs from these two forms in having a broader cell. Sts. 35,36,46, Indonesia (Borneo, Sumatra), Europe, Africa. New to Thailand.

31. *E. obesum* Joshua Pl.23, f.7,8,12.
West 1905, 2, 29, Pl.36, f.16,17; Krieger 1937, 495, Pl.59, f.9,10; Croasdale & Flint 1986, Fl. New Zeal. Desm.vol.1, 95, Pl.17, f.7,8.
L. 40–79 μm , B. 24–37 μm , and I. 7.5–11 μm . New Zealand. New to Thailand.
32. *E. politum* Krieger Pl.26, f.6.
Krieger 1937, 482, Pl.57, f.2,3; Scott, Grönblad, Croasdale 1965, Act. Bot. Fenn. 69,34, f.43.
L. 33 μm , B. 17.5 μm , and I. 8. μm . The specimens examined from Thailand are smaller in size than that of the form described and reported by European authors. The outline of a cell of my material is coincident with the typical form. St. 39. Brazil. New to Thailand.
33. *E. praemorsum* (Nordst.) Schmidle Pl.25, f.6.
Krieger 1937, 13:1, 621, Pl.88, f.18–20; Förster 1982, 337, Pl.42, f.9,10.
L. 53–55 μm , B. 33–37.5 μm , and I. 6.5–9.5 μm . Cells of medium size, deeply constricted at the middle, sinus narrowly linear, 5-lobed; semicells truncate-pyramidate, incision between the polar and lateral lobes subrectangular and rounded at the extremity, polar lobe obtrapeziform, side ones slightly diverging, apex convex and with an acutely open incision, angles with a stout spine, lateral those of the lower, end of lateral lobules emarginate or with 3 denticulations; cell wall with a pair of scrobiculations and a pair of warts just above the scrobiculation, some warts disposed within the lateral lobules. Sts. 1,36. Indonesia (Sumatra), Australia, New Zealand. New to Thailand.
34. *E. pseudocoralloides* Fritsch Pl.23, f.9; Pl.24, f.7.
Fritsch 1918, Annals South African Mus. 9, 549, textf. 25; Prescott et al. 1977, 2:2, 98, Pl.74, f.25.
L. 19.5–23 μm , B. 15.5–17.6 μm , and I. 4.5–5 μm . Cells small, approximately 1.3 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear; semicells subquadrate, polar lobe rectangular, apex straight with a deep and open incision, apical angles with a short divergent spine, lateral lobes rectangular, lateral margin retuse, basal and lateral angles acute, incision between polar and lateral lobes rectangularly rounded; cell wall smooth. Sts. 26,30,44. U.S.A., S.Africa. New to Thailand.
35. *E. serratum* Joshua Pl.26, f.8.
Joshua 1886, Jour. Linn. Soc. Bot. 21, 639, Pl.23, f.1,2; Scott & Prescott, 1961, 17, 39, Pl.11, f.6,7; Hirano 1967, 5, 60, Pl.13, f.2.
L. 48.5 μm , B. 31 μm , and I. 6.5 μm . Cells of medium size, approximately 1.6 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear;

semicells 5-lobed, polar lobe with a deep and open median incision, of a long elliptic form, apical angles with a short and sharp spine, apex convex, lateral lobes divided into two lobules of the same spine size, lobules further divided into two emarginate parts; cell wall with a protuberans at the middle above the isthmus and two scrobiculations above the protuberans, lobules with a wart. St. 44. India, Ceylon, Burma, Indonesia (Sumatra, Borneo), Cambodia. New to Thailand.

36. *E. sinuosum* Lenorm. var. *sinuosum*

Krieger 1937, 499, Pl.62, f.9–11; Ruzicka 1:2, 421, Pl.69, f.5–7; Förster 1982, 338, Pl.44, f.1.

L. 62–72.5 μm , B. 36–48.5 μm , and I. 6.5–11 μm . St. 1. India, Burma, Thailand, Indonesia (Java, Sumatra, Borneo), Europe, N. & S.America, Africa, Australia.

36a. var. *aboense* (Elfv.) Cedergren

Pl.23, f.20.

Krieger 1937, 500, Pl.62, f.12–15.

L. 44–48 μm , B. 24–26.5 μm , and I. 6.5–7 μm . Sts. 1,3,40. Europe, U.S.A.

36b. var. *dideltoides* Krieger

Pl.23, f.15,16.

Krieger 1932, 214, Pl.22, f.2; Krieger 1937, 501, Pl.62, f.18,19; Hirano 1967, Nature Life SEA. 5, 60.

L. 59–123 μm , B. 39.6–66 μm , and I. 11–17.5 μm . Sts. 17,22,24,28,49. Indonesia (Sumatra), Japan, Thailand.

36c. var. *perforatum* Krieger

Pl.23, f.19.

Krieger 1937, 503, Pl.62, f.24.

L. 46–59 μm , B. 24–35 μm , and I. 6.5–11 μm . Sts. 1,30,38,45,53. Europe, Japan. New to Thailand.

36d. var. *reductum* W. & G.S.West

Pl.23, f.17,18.

West 1905, 2, 22, Pl.36, f.2,3; Krieger 1937, 503, Pl.62, f.25; Scott & Prescott 1961, 17,40, Pl.9, f.8.

L. 51–80 μm , B. 26.5 μm , and I. 9–13 μm . Sts. 17,19,28,29,36,41,45,51. Thailand, Indonesia (Borneo, Sumatra), Ceylon, Singapore, Europe, Africa.

36e. var. *scrobiculatum* Nordst.

Pl.23, f.2.

Krieger 1937, 503, Pl.62, f.2,3; Förster 1982, 339, Pl.44, f.2.

L. 48.5 μm , B. 26.8 μm , and I. 9 μm . Sts. 35,49. Thailand, Cambodia, Indonesia (Borneo, Sumatra), Europe.

36f. var. *subjenneri* W. & G.S.West

Pl.25, f.4.

West 1902, Trans. Linn. Soc. Bot. 6,148, Pl.19, f.17; Krieger 1937, 505, Pl.63, f.7.

L. 42–66 μm , B. 31–32 μm , and I. 6.5–10 μm . Polar lobe elongated, slightly dilated upward, incision between polar and lateral lobes broad and somewhat rectangularly rounded, lateral lobes rectangular, retuse at the middle, the shape of lateral lobes seem to be 2 divided lobules. Sts. 27,28,31,49. Burma, Ceylon, Indonesia (Java), Japan. New to Thailand.

37. *E. spinulosum* Delp. var. *spinulosum* Pl.25, f.9.
Krieger 1937, 633, Pl.93, f.1–3; Scott & Prescott 1961, 40, Pl.10, f.3; Förster 1982, 340, Pl.46, f.6,7.
L. 53–54 μm , B. 48.5–51 μm , and I. 10–13 μm . Sts. 12,43,44. India, Ceylon, Burma, Indonesia (Java, Sumatra), Cambodia, Japan, Europe, Africa. New to Thailand.
- 37a. var. *inermius* (Nordst.) Nordst. Pl.25, f.7,8.
Krieger 1932, 215, Pl.21, f.2; Krieger 1937, 635, Pl.93, f.8–10; Ruzicka 1981, 537, Pl.86, f.11,12.
L. 53–75 μm , B. 48–53 μm , and I. 9–13 μm . Sts. 1,14,24,25,26,32,43,51. India, Ceylon, Burma, Indonesia (Java, Sumatra), Europe, Africa, Australia.
38. *E. sublobatum* Bréb. var. *sublobatum* Pl.25, f.10,11; Pl.26, f.27.
West 1905, 2, 73, Pl.40, f.17; Krieger 1937, 544, Pl.74, f.1–3.
L. 18.5–31 μm , B. 15–27 μm , and I. 4.5–9 μm . Sts. 1,24,31,36. Europe, U.S.A., S.America. New to Thailand.
- 38a. var. *javanicum* (Bernard) Krieger Pl.23, f.10,13.
Krieger 1932, 215, Pl.20, f.9.
L. 22 μm , B. 13.2 μm , and I. 4.5 μm . St. 29. Indonesia (Java, Sumatra, Bali). New to Thailand.
- 38b. var. *kriegeri* Grönblad
Krieger 1937, 545, Pl.74, f.7,8; Hirano 1967, 5, 61, Pl.8, f.5.
L. 22 μm , B. 13 μm , and I. 4.5 μm . St. 38. Indonesia (Sumatra), Japan, Europe.
- 38c. var. *obtusatum* (Gutw.) Krieger Pl.22, f.10.
Krieger 1937, 545, Pl.74, f.9–11.
L. 17.6 μm , B. 10.5–13 μm , and I. 3.5–4.5 μm . Small in size, 1.5 times longer than the breadth, middle constriction deep and closed; semicells subrectangular, apex concave, apical angles rounded, lateral margin retuse in the upper part, lower margin convex; cell wall with a distinct pore just below the middle of an apex. Sts. 1,17,25,26,29,36,39,46,49. Indonesia (Java, Sumatra,Bali), Japan. New to Thailand.
39. *E. subcrassum* Fritsch & Rich var. *subcapitatum* Grönblad & Scott Pl.26, f.9.
Förster 1982, 492, Pl.40, f.10.
L. 48–50 μm , B. 26.4–27.7 μm , and I. 7.5 μm . St. 49. Africa. New to Thailand.
40. *E. substellatum* Nordst.
Krieger 1932, 216, Pl.21, f.8; Krieger 1937, 629, Pl.80, f.21–24; Hirano 1972, Contr. Biol. Lab. Kyoto Univ. 23, 145, Pl.5, f.3,8.
L. 48.5–59 μm , B. 48.5–57 μm , and I. 8–11 μm . Sts. 20,24,25,43,51. India, Burma, Thailand, Cambodia, Indonesia (Java), Japan, Europe.
41. *E. turgidum* Wall. Pl.25, f.1.
Krieger 1937, 624, Pl.89, f.7,8; Hirano 1967, Nature Life 5,61.
L. 121 μm , B. 97 μm , and I. 31 μm . St. 19. India, Burma, Thailand, Indonesia

(Java, Sumatra), Japan, Australia.

42. *E. turneri* W. West Pl. 29, f. 1.
 West 1905, 2, 37, Pl. 37, f. 9, 10; Krieger 1932, 216, Pl. 20, f. 15 (forma); Krieger 1937, 589, Pl. 82, f. 20, 21.
 L. 26.5–46 μm , B. 22–31 μm , and I. 6.5–8.5 μm . Sts. 26, 36, 39, Indonesia (Sumatra, Bali), Europe, Africa, Australia, New Zealand.
43. *E. validum* W. & G. S. West var. *validum* Pl. 22, f. 11; Pl. 26, f. 14.
 Krieger 1937, 74, Pl. 74, f. 18–20; Ruzicka 1:2, 452, Pl. 74, f. 3–8.
 L. 35 μm , B. 26.5 μm , and I. 6.5 μm . Sts. 1, 40. Ceylon, Europe, N. America. New to Thailand.
- 43a. var. *glabrum* Krieger Pl. 22, f. 13.
 Krieger 1937, 547, Pl. 74, f. 21, 22; Hirano 1967, Nat. Life SEA. 5, 61, Pl. 9, f. 6; Förster 1982, 344, Pl. 40, f. 3.
 L. 22–28.5 μm , B. 15.4–22 μm , and I. 5–6.5 μm . Sts. 1, 36, 40. Burma, Thailand, Indonesia (Borneo).
- 43b. var. *subvalidum* (Behre) Förster Pl. 26, f. 14.
 Förster 1982, 344, Pl. 40, f. 4, 5.
 L. 22 μm , B. 15.4 μm , and I. 4.5 μm . St. 5. Indonesia (Sumatra), Philippines, Brazil, Africa. New to Thailand.
1. *Micrasterias alata* Wall. Pl. 26, f. 19.
 Krieger 1932, 217, Pl. 24, f. 4; Krieger & Gerloff 1939, *Micrasterias* 61, Pl. 114, f. 1–4; Scott & Prescott 1961, 45, Pl. 15, f. 4; Förster 1982, 355, Pl. 55, f. 2, 3.
 L. 189–202 μm , B. 176–180 μm , and I. 15.4–17.3 μm . Sts. 20, 21, 24. India, Burma, Ceylon, Indonesia (Java), Cambodia, U.S.A., Brazil, Australia.
2. *M. anomala* Turner Pl. 32, f. 1.
 Turner 1892, K. Sv. Vet. Akad. Handl. 25, 97, Pl. 22, f. 1; West 1897, Jour. Linn. Soc. Bot. 33, Pl. 9, f. 1; Krieger & Gerl. 1939, 77, Pl. 121, f. 9, 10; Scott & Prescott 1961, 45, Pl. 19, f. 1–4.
 L. 288 μm , B. 193 μm , and I. 35 μm . Basal part of a polar lobe not cylindrical but widely excavated (shown as by Turner, West and Playfair) at the extremity of the incision between polar and upper lateral lobes. St. 10. India, Burma, Singapore. New to Malaysia.
3. *M. apiculata* (Ehrenb.) Menegh. var. *lacerata* Turner Pl. 28, f. 4.
 Turner 1892, 94, Pl. 22, f. 3; West 1908, 3, 97, Pl. 47, f. 1, 2; Krieger 1939, 80, Pl. 122, f. 5–7; Hirano 1967, AE. Asia 5, 62, Pl. 15, f. 5.
 L. 264–273 μm , B. 189–198 μm , and I. 33–35 μm . St. 45. India, Ceylon, Burma, Cambodia, Malaysia (Malacca), Japan, Europe, Africa.
4. *M. arcuata* Bail. var. *arcuata* Pl. 26, f. 22, 23.
 Krieger & Gerloff 1939, 10, Pl. 97, f. 1–3; Förster 1982, 360, Pl. 48, f. 4, 5.

- L. 57 μm , B. 68 μm , and I. 11 μm . Sts. 36,38,39,41. Europe, U.S.A., Africa. New to Thailand.
- 4a. var. *compacta* Förster
Krieger & Gerloff 1939, 13:2, 10, Pl.97, f.1–3; Förster 1982, 360, Pl.48, f.4,5.
L. 55 μm , B. 57 μm , and I. 11 μm . Sts. 1,3. Europe, N.America, Africa. New to Thailand.
- 4b. var. *expansa* (Bail.) Nordst. Pl.26, f.21.
Krieger & Gerloff 13:2, 11, Pl.97, f.4; Förster 1982, 360, Pl.48, f.8.
L. 50–57 μm , B. 40–44 μm , and I. 6.5–8 μm . Sts. 1,36,39,40,41. N. & S.America. New to Thailand.
5. *M. ceratofera* Joshua Pl.31, f.6.
Scott & Prescott 1961, 48, Pl.15, f.2,3; Hirano 1967, Nat. Life SE-Asia, 5, 62, Pl.14, f.4; Förster 1982, 363, Pl.65, f.2.
L. 145 μm , B. 79 μm , and I. 20 μm . St. 20. Burma, Thailand, Indonesia (Sumatra, Borneo).
6. *M. ceylanica* Fritsch var. *ceylanica*
Krieger 1932, 217, Pl.24, f.5; Krieger & Gerloff 1939, 13:2, 37, Pl.101, f.13; Croasdale & Flint 1986, Fl. New Zealand Vol.1, 109, Pl.24, f.3,4.
L. 59 μm , B. 66 μm , and I. 9 μm . Sts. 43,51. India, Ceylon, Burma, Indonesia (Sumatra), Australia, New Zealand.
- 6a. var. *wallichiana* (Turner) Krieger Pl.28, f.1,2.
Krieger & Gerloff 1939, 38, Pl.101, f.14–16.
L. 48.5 μm , B. 48.5 μm , and I. 9 μm . St. 18. India, Burma, Indonesia (Sumatra, Borneo). New to Thailand.
7. *M. cunningtoni* G.S.West Pl.27, f.2.
Krieger & Gerloff 1939, 13:2, 85, Pl.127, f.4,5; Hirano 1967, Nat. Life SE-Asia 5, 62, Pl.12, f.3.
L. 132–180 μm , B. 110–123 μm , and I. 22–31 μm . Cells large, 1.2 times longer than the breadth, deeply constricted at the middle, sinus slightly open and acuminate at the extremity; semicells trapeziform, incision between polar and lateral lobes deep and sublinear, polar lobe broadly cuneate, lateral sides slightly concave, apical angles truncate or emarginate, apex convex, fairly and deeply retuse at the middle, incision between upper and lower lateral lobes deep and open sublinearly, upper and lower lateral lobes further divided into 2 or 3 lobules. Sts. 35,37,39. Thailand, Africa.
8. *M. decemdentata* (Näg.) Arch.
Krieger & Gerloff 1939, 34, Pl.104, f.9–11; Ruzicka 1981, 575, Pl.94, f.5–13; Förster 1982, 367, Pl.50, f.7,8.
L. 53 μm , B. 59.5 μm , and I. 8.5 μm . St. 19. Cosmopolitan. New to Thailand.
9. *M. lux* Joshua Pl.29, f.6.

Joshua 1886, Jour. Linn. Soc. Bot. 21, 636, Pl.22, f.12; Krieger & Gerloff 1939, 13:2, 97, Pl.130, f.5; Scott & Prescott 1961, 49, Pl.17, f.1–3.

L. 202–228 μm , B. 194–220 μm , and I. 17.5–22 μm . Cells rhomboidal-circular, deeply constricted at the middle, sinus narrowly linear but outer part acutely open; semicells 5-lobed, incision between polar and lateral lobes narrowly linear, lower part of a polar lobe parallel in sides, upper part widely dilated, apex widely retuse, lateral lobes divided into two parts of lobules and each of them further divided into two parts, each part gradually narrow to the extremity and its end deeply emarginate. Sts. 19,22. India, Burma, Indonesia (Sumatra, Borneo), Japan. New to Thailand.

10. *M. mahabuleshwariensis* Hob. var. *mahabuleshwariensis* Pl.30, f.9,10.
Krieger & Gerloff 1939, 49, Pl.109, f.7–10; Ruzicka 1981, 593, Pl.99, f.1–5; Förster 1982, 376, Pl.57, f.1.

L. 136–150 μm , B. 119–130 μm , and I. 17.5–22 μm . Sts. 26,43,51. India, Burma, Ceylon, Thailand, Indonesia (Java), Cambodia, U.S.A., Brazil, Africa, Australia.

- 10a. var. *surculifera* Lagerh.

Krieger 1932, 218, Pl.23, f.2; Krieger & Gerloff 1939, 53, Pl.111, f.1,2; Scott & Prescott 1961, 50, Pl.16, f.1,2.

L. 138–141 μm , B. 123–128 μm , and I. 18–19 μm . St. 20. India, Ceylon, Thailand, Indonesia (Java, Sumatra).

- 10b. var. *wallichii* (Grun.) W. & G.S.West Pl.30, f.11.

West 1905, 2, 122, Pl.54, f.7,8, Pl.55, f.1–3; Krieger & Gerloff 1939, 54, Pl.111, f.8,9; Ruzicka 1981, 602, Pl.100, f.5–13; Förster 1982, 379, Pl.57, f.4.

L. 145–198 μm , B. 97–119 μm , and I. 17.6–22 μm . St. 22. India, Burma, Japan, Europe, Australia, New Zealand. New to Thailand.

11. *M. moebii* (Borge) W. & G.S.West var. *moebii* Pl.24, f.1.

Krieger 1939, 13:2, 42, Pl.107, f.4–6.

L. 119–128 μm , B. 106–114 μm , and I. 31–33 μm . St. 22. Thailand, Australia.

- 11a. var. *burmense* W. & G.S.West Pl.24, f.2.

West 1907, Ann. R. Bot. Calcutta 6, 201, Pl.14, f.19,20; Krieger & Gerloff 1939, 13:1, 43, Pl.107, f.7,8.

L. 119–132 μm , B. 108–110 μm , and I. 39–40 μm . St. 21. India, Burma. New to Thailand.

12. *M. pinnatifida* (Kütz.) Ralfs Pl.29, f.7.

West 1905, 2, 80, Pl.41, f.7–11; Krieger 1932, 218, Pl.23, f.4; Ruzicka 1981, 571, Pl.93, f.1–13; Förster 1982, 383, Pl.49, f.1–3.

L. 59–66 μm , B. 65–66 μm , and I. 10–11 μm . Sts. 10,19,22,24,32,47,51. India, Ceylon, Thailand, Indonesia (Borneo), Europe, U.S.A., Brazil.

13. *M. radians* Turner var. *radians* Pl.29, f.9.

Krieger & Gerloff 1939, 67, Pl.115, f.8, Pl.116, f.1; Scott & Prescott 1961, 51, Pl.23,

f.1; Hirano 1967, Nat. Life SE-Asia 5, 10, Pl., f.2; Förster 1982, 384, Pl.53, f.5–7.

L. 112–136 μm , B. 101–119 μm , and I. 13–17.6 μm . Sts. 19,20,22,24,25,26,51,53. India, Burma, Thailand, Cambodia, Japan, S.America, Australia.

13a. **var. *siamensis* Hirano, var. nov.**

Var. differt a var. *radiante* cellulis cum lobis lateralibus et lobulis lateralibus brevibus, cum incisuris inter lobos et lobulos mediocriter profundis et elliptico apertis ad extremum rotundatis. Long. 110 μm , lat. 92.4 μm , lat. isthm. 21 μm .

Type Loc. Phuket, Thailand.

Semicells 5-lobed, incision between polar and upper lateral lobes deep and open elliptically, and rounded at the extremity, lateral incisions between lateral lobes and lateral lobules open elliptically and rounded at the extremity. L. 118 μm , B. 92.4 μm , and I. 21 μm . St. 18.

14. *M. rotata* (Grev.) Ralfs var. *rotata* Pl.28, f.3.

West 1905, 2,102, Pl.48, f.1–6; Krieger & Gerloff 1939, 100, Pl.136, f.1; Ruzicka 1981, 622, Pl.104, f.1–20; Förster 1982, 387, Pl.62, f.2–5.

L. 367–440 μm , B. 300–374 μm , and I. 30–31 μm . Sts. 37,39,40,41,44. India, Burma, Thailand, Singapore, Japan, Europe, N. & S.America.

14a. **var. *curvata* Hirano, var. nov.** Pl.27, f.3.

Var. differt a var. *rotata* cellulis cum lobis lateralibus et lobulis lateralibus sursum interiore curvata. Long. 396 μm , lat. 127–167 μm , lat. isthm. 39.6 μm . St. 44.

Type: Pl.28, f.3. Loc. Doi Step, Thailand.

15. *M. subdenticulatum* (Nordst.) Krieger Pl.28, f.7.

Krieger 1932, 218, Pl.24, f.3; Krieger & Gerloff 1939, 13:2, 114, Pl.142, f.4–6.

L. 180 μm , B. 127.6 μm , and I. 26.4 μm . St. 1. Indonesia (Sumatra), New Zealand. New to Thailand.

16. *M. suboblonga* Nordst. var. *suboblonga* Pl.29, f.10.

Krieger & Gerloff 1939, 13:2, 41, Pl.106, f.8–10.

L. 61.6 μm , B. 49.7 μm , and I. 11 μm . Cells approximately 1.3 times longer than the breadth, deeply constricted at the middle, sinus narrowly linear; semicells 3-lobed, incision between polar and lateral lobes linear or somewhat oblong-ellipsoidal and rounded at the extremity, apical angles of a semicell rounded, polar lobe with apex convex and retuse at the middle in some specimens, upper and lower lateral angles of lateral lobes rounded. Sts. 39,40. New Zealand.

16a. **var. *tecta* Krieger** Pl.26, f.20; Pl.28, f.6.

Krieger 1932, 219, Pl.23, f.3; Krieger & Gerloff 1939, 13:2, 42, Pl.106, f.11,12; Scott & Prescott 1961, 52, Pl.22, f.3,4.

L. 53–92 μm , B. 37–73 μm , and I. 11–17 μm . Sts. 1,3,36,38,40,41,51. Indonesia (Sumatra). New to Thailand.

17. *M. tetraptera* W. & G.S.West var. *longesinuata* Krieger Pl.29, f.8.

Krieger & Gerloff 1939, 13:2, 93, Pl.127, f.2.

L. 176 μm , B. 123 μm , and I. 22 μm . Specimens from Thailand are similar to the figure given by Krieger. They are also similar to *M. cunningtonii* G.S.West from Africa. The cell wall is covered with warts. St. 40. Newfoundland. New to Thailand.

18. *M. tropica* Nordst. var. *tropica* Pl.30, f.8.

Ruzicka 1981, 588, Pl.97, f.1–4; Förster 1982, 392, Pl.56, f.1; Croasdale & Flint 1986, 109, Pl.25, f.1.

L. 106–110 μm , B. 84–99 μm , and I. 19–20 μm . St. 26. India, Burma, Indonesia (Sumatra), Europe, S.America, Africa, Australia. New to Thailand

- 18a. var. *polonica* Eichl. & Racib. Pl.31, f.5.

Krieger & Gerloff 1939, 60, Pl.113, f.2–4; Scott & Prescott 1961, 53, Pl.16, f.7 (forma).

L. 127–147 μm , B. 88–90 μm , and I. 17–18 μm . Sts. 47,53. Thailand, China, Japan, Europe.

1. *Xanthidium acanthophorum* Nordst. Pl.34, f.6.

Nordstedt 1880, Algis et Char. 11, Pl.1, f.20; Skuja 1949, 148, Pl.33, f.13; Scott & Prescott 1958, Record Amer.-Austr. Arnhem Land 3,55, F.11:1.

L. 48.4–49.7 μm , B. 35–44 μm , and I. 15.4 μm . Sts. 51,53. Burma, Ceylon, Indonesia (Java), Cambodia, Europe, Australia. New to Thailand.

2. *X. antilopaeum* (Bréb.) Kütz. var. *laeve* Schmidle Pl.31, f.1.

West 1911, 4, 68, Pl.109, f.3; Prescott et al. 1982, 2:4, 52, Pl.315, f.3.

Lssp. 70.4 μm , Bssp. 57 μm , and I. 20 μm . St. 9. Cambodia, Japan, Europe. New to Thailand.

- 2a. var. *longispinum* Scott & Prescott Pl.36, f.2–4.

Scott & Prescott 1961, 79, Pl.38, f.2; Hirano 1972, Contr. 23, 143, Pl.7, f.5,6.

Lssp. 62–92.5 μm , B.ssp. 53–75 μm , and I. 15.4–23 μm . Sts. 36,39,40. Cambodia, Europe. New to Thailand.

3. *X. armatum* (Bréb.) Rabenh. var. *anguligerum* Krieger Pl.34, f.1,2.

Krieger 1932, 192, Pl.14, f.2; Scott & Prescott 1961, 80, Pl.39, f.4,5.

Lssp. 88–90 μm , Bssp. 66–68 μm , and I. 22–26.4 μm . Sts. 40,41. Indonesia (Sumatra, Borneo). New to Thailand.

- 3a. var. *cervicorne* W. & G.S.West

West 1911, 4, 55, Pl.106, f.1–4; Prescott et al.1982, 2:4, 57, Pl.318, f.4,5.

Lssp. 110 μm , Bssp. 79 μm , and I. 26.4 μm . St. 29. Europe, U.S.A. New to Thailand.

4. *X. burkillii* W. & G.S.West var. *burkillii*

West 1907, 210, Pl.15, f.10; Scott & Prescott 1961, 80, Pl.40, f.1.

Lssp. 48 μm , Bssp. 49 μm , and I. 10 μm . Sts. 26,37. Burma, Indonesia (Java, Borneo). New to Thailand.

- 4a. var. *alternans* Skuja Pl.36, f.1.
 Skuja 1949, 149, Pl.33, f.16; Scott & Prescott 1961, 80, Pl.40, f.2.
 Lssp. 48.4 μm , Lcsp. 83.6 μm , Bssp. 49.3 μm , Bcsp. 74.8 μm , and I. 10 μm . Sts. 10,47,49. Burma, Indonesia (Borneo). New to Thailand.
5. *X. controversum* W. & G.S.West Pl.36, f.5.
 West 1911, 4, 59, Pl.107, f.5,6; Prescott et al. 1982, 2:4, 63, Pl.316, f.3.
 L. 37–44 μm , B. 33–35 μm , and I. 10 μm . St. 53. Europe, N. & S.America. New to Thailand.
6. *X. cristatum* Bréb. var. *delpontei* Roy & Bisset Pl.36, f.6.
 West 1911, 74, Pl.111, f.5.
 Lssp. 53 μm , Bssp. 51 μm , and I. 11 μm . St. 34. Europe. New to Thailand.
7. *X. freemanii* W. & G.S.West Pl.34, f.5.
 West 1902, Trans. Linn. Soc. Bot. 6, 158, Pl.20, f.28.
 Lssp. 121 μm , Bssp. 74.8 μm , and I. 22 μm . Cells large, approximately 1.6 times longer than the breadth without spines, deeply constricted at the middle, sinus narrowly linear but outer part acutely open; semicells broadly ovate, apex slightly convex, lateral margin convex and convergent upward; cell wall densely punctate, lateral margin with a series of spines at and within the side, spines sharp and curved upward. St. 24. Ceylon. New to Thailand.
8. *X. hastiferum* Turner var. *javanicum* (Nordst.) Turner f. *planum* Turn. Pl.33, f.1.
 Turner 1892, 25, 100, Pl.12, f.23, Pl.13, f.6; Scott & Prescott 1961, 81, Pl.40, f.5; Prescott et al. 1982, 2:4, 71, Pl.326, f.6.
 Lssp. 46–62 μm , Bssp. 48.4–70 μm , and I. 10–15 μm . Semicells slightly broader than the length without spine, apical spines more developed than those of the typical form and apical spines smaller than the lateral spines. Sts. 22,25,32. India, Indonesia (Java, Sumatra), U.S.A. New to Thailand.
9. *X. multispinum* Hirano, sp. nov. Pl.35, f.1,2.
 Cellulae magnae, circiter 1,3–1,5 plo longiores quam latae sine spinis, profunde constrictae ad medium, sinu angusto lineari extremo leviter dilatato; semicellulae triangulari-pyramidatae, apice leviter convexo, angulis apicalibus late rotundatis, marginibus lateralibus leviter concavis, angulis basalibus late rotundatis, membrana dense et minute scrobiculata in centro semicellularum, margine laterali unoquoque et apice serie spinarum acutarum praedito et serie spinarum similium numerosarum intra marginem; serie horisontali conicarum centicularum magnarum transverse supra isthmum praedita; isthmo excavato apice denticulis magnis conicis praedito. Long. 193–198 μm , lat. 145 μm , lat. isthm. 41.8 μm . St. 10.
 Type: Pl.35, f.1,2. Loc. Kuala Lumpur, Malaysia.
 Cells large, approximately 1.3–1.5 times longer than the breadth excluded spines, deeply constricted at the middle, sinus narrowly linear in the extremity but slightly open to the outer part of constriction; semicells triangulari-pyramidal, apex convex, apical

angles broadly rounded, lateral margin slightly concave or almost straight, basal angles broadly rounded; cell wall scrobiculated on all the surface of semicell, lateral margin and apex furnished with numerous spines at the margin and within the margin, with a horizontal series of conical denticulations just above the isthmus; side view of semicell oblong-elliptic, sinus excavated, with a conical denticulations on each side of the basal part of semicell, vertical series of spines disposed from the base to apex. Lssp. 193–198 μm , Bssp. 145 μm , and I. 41.8 μm . St. 10. Thailand.

10. *X. perissacanthum* Scott & Prescott var. *minus* Scott & Prescott Pl.37, f.2.
Scott & Prescott 1961, 83, Pl.41, f.3.
Lssp. 61.6 μm , Bssp. 52.8 μm , I. 13 μm . St. 3. Indonesia (Sumatra). New to Thailand.
11. *X. raciborskii* Gutw. Pl.34, f.7.
Krieger 1932, 192, Pl.25, f.4.
Lssp. 40.5–48.5 μm , Bssp. 39.6–43 μm , I. 15.4–17.5 μm . Sts. 36,37. Indonesia (Sumatra). New to Thailand.
12. *X. sexmamilatum* W. & G.S.West var. *pulneyense* Iyengar & Bai Pl.35, f.3–5.
Scott & Prescott 1961, 84, Pl.39, f.2; Hirano 1972, Contr. 23, 143, Pl.8, f.1.
L. 44–53 μm , B. 36–46 μm , I. 8–11 μm . Sts. 47,53. Cambodia, Indonesia (Sumatra). New to Thailand.
13. *X. spinosum* (Joshua) W. & G.S.West Pl.34, f.3,4.
Skuja 1949, 151, Pl.33, f.11,12; Scott & Prescott 1961, 84, Pl.37, f.2,3. (forma); Hirano 1972, Contr. 23, 143, Pl.8, f.3.
Lssp. 49–56 μm , Bssp. 50–55 μm , I. 26.5–31.5 μm . Semicells transversely elliptic, margins somewhat undulate, spines short, cell wall punctated, scrobiculations at the basal part of a semicell, disposed in a horizontal or arch form of one to 3–4 series. Sts. 10,23,24. Burma, Indonesia (Sumatra), Cambodia.
14. *X. subtrilobum* W. & G.S.West
Scott & Prescott 1961, 84, Pl.39, f.1.
Lssp. 51–80 μm , Bssp. 48–57 μm , I. 11–13 μm . Sts. 12,32. Indonesia (Java, Sumatra, Borneo). New to Thailand.
15. *X. superbum* Elfv. Pl.33, f.11; Pl.37, f.1.
Scott & Prescott 1961, 85, Pl.37, f.5.
Lssp. 83.5–92 μm , Bssp. 57–66 μm , and I. 17.6–18.5 μm . Lateral spines of a semicell large and long, disposed in a pair but variable in number (some of them incomplete, especially an apical one). St. 24. Indonesia (Sumatra). New to Thailand.
1. *Arthrodesmus apiculatus* Joshua Pl.29, f.11.
Joshua 1886, 644, Pl.24, f.15; Skuja 1949, 146, Pl.33, f.7; Scott & Prescott 1961, 73, Pl.34, f.11.
L. 44 μm , B. 40 μm , and I. 8.6 μm . St. 19. Burma, Indonesia (Sumatra). New to

Thailand.

2. *A. arcuatus* Joshua Pl.32, f.6.
 Joshua 1886, Jour. Linn. Soc. Bot. 21, 644, Pl.24, f.14; Scott & Prescott 1961, 73, Pl.35, f.1; Prescott et al. 2:4, 6, Pl.302, f.4.
 L. 33–43 μm , B. 33–42 μm , and I. 7.5–12.3 μm . Sts. 20,24. Burma, Indonesia (Borneo), U.S.A, Africa, Australia. New to Thailand.
3. *A. borgei* Thomasson Pl.36, f.11.
 Thomasson 1960, Nov. Act. Reg. Soc. Sci. Upsal. 17, 12, 14, Pl.5, f.5.
 Lssp. 47.4 μm , Bssp. 33 μm , I. 9 μm . St. 20. New to Thailand.
4. *A. bulnheimii* Racib. var. *bulnheimii* Pl.32, f.2,3.
 West 1911, 4, 105, Pl.116, f.1,2; Prescott et al. 2:4, 8, Pl.300, f.5 Pl.301, f.3,6,8,11.
 Lssp. 15.4–22 μm , Bssp. 24–25 μm , I. 6.5–10 μm . Sts. 36,37. Europe, U.S.A. New to Thailand.
- 4a. var. *subincus* W. & G.S.West Pl.33, f.7.
 West 1911, 4, 105, Pl.116, f.3; Prescott et al. 1982, 2:4, 9, Pl.301, f.7.
 L. 24–26 μm , B. 20–26.4 μm , I. 5.3–5.7 μm . Sts. 39,53. Europe, S.America, Africa, Australia. New to Thailand.
5. *A. convergens* Ehrenb. var. *convergens*
 West 1911, 4, 106, Pl.116, f.4–13; Scott & Prescott 1961, 74, Pl.34, f.7–10; Hirano 1972, Contr. 23, 142, Pl.4, f.1; Pl.7, f.2,4.
 L. 26.4–39 μm , Bssp. 31–48 μm , I. 5–11 μm . Sts. 43,49,53. Cosmopolitan. New to Thailand.
- 5a. var. *curtus* Turner Pl.32, f.4.
 Scott & Prescott 1961, 74, Pl.34, f.5,6.
 L. 59.4 μm , Bssp. 55–57 μm , I. 11–17 μm . Semicells subhexagonal, deeply constricted, sinus angusto-linear, apex almost straight, lower lateral margin convex, spines slender and recurved in contrast with the large size of cell body. St. 25. India, Indonesia (Java). New to Thailand.
6. *A. curvatus* Turner var. *borgei* Scott & Prescott Pl.33, f.8.
 Scott & Prescott 1961, 75, Pl.34, f.2,3.
 L. 28.5–31 μm , B. 24–31 μm , and I. 7.5–9 μm . Sts. 20,49. Indonesia (Sumatra, Borneo). New to Thailand.
- 6a. var. *kalimantanus* Scott & Prescott Pl.31, f.4; Pl.32, f.5.
 Scott & Prescott 1961, 75, Pl.34, f.1; Hirano 1972, Contr. 23, 142, Pl.4, f.2.
 L. 51–64 μm , Bssp. 51–57 μm , and I. 15–17.6 μm . Sts. 10,24,32,46,51. Indonesia (Borneo), Cambodia, Thailand.
- 6b. var. *latus* Scott & Prescott Pl.49, f.17.
 Scott & Prescott 1961, 76, Pl.33, f.1–3.

- L. 35–42 μm , B. 33–42 μm , and I. 6.5–11 μm . Sts. 19,25,32. Indonesia (Java, Sumatra, Borneo). New to Thailand.
7. *A. gibberulus* Joshua Pl.33, f.6.
 Joshua 1885, Jour. Bot. 23, 34, Pl.254, f.6; West 1902, 192, Pl.22, f.22; Scott & Prescott 1961, 76, Pl.35, f.6.
 L. 36 μm , B. 35 μm , and I. 9 μm . Semicells hexagonal-elliptic, apex somewhat flat-tend, lateral spines long and convergent, sinus linearly open. St. 23. Burma, Ceylon. New to Thailand.
 8. *A. incus* (Bréb.) Hass. var. *validus* W. & G.S. West Pl.31, f.2.
 West 1911, 4, 96, Pl.114, f.9,10; Krieger 1932, 191, Pl.13, f.11.
 Lssp. 24–26 μm , Bssp. 24 μm , and I. 5.3 μm . St. 7. Ceylon, U.S.A. New to Thailand.
 9. *A. octocornis* Ehrenb. Pl.25, f.5; Pl.33, f.4.
 West 1911, 4, 111, Pl.117, f.6–10; Scott & Prescott 1961, 77, Pl.35, f.9–12; Prescott et al. 1982, 2:4, 26, Pl.295, f.10.
 Lssp. 11–16.7 μm , Bssp. 10–16.7 μm , and I. 4.4–5.3 μm . Sts. 35,36,41. Cosmopolitan. New to Thailand.
 10. *A. subulatus* Kütz. Pl.31, f.2.
 West 1911, 4, 109, Pl.116, f.14, Pl.117, f.1; Hirano 1972, Contr. 23, 142, Pl.7, f.1; Prescott et al. 1982, 2:4, 31, Pl.307, f.2,3; Pl.308, f.3,4,6,9,11–14.
 L. 31 μm , Bssp. 40 μm , and I. 10 μm . St. 9. India, Cambodia, Europe, U.S.A., S.America, Africa, Madagascar. New to Thailand.
 11. *A. subvalidus* Grönblad Pl.32, f.2,3.
 Scott & Prescott 1961, 78, Pl.35, f.4,5; Prescott et al. 1982, 2:4, 31, Pl.307, f.3,4,6,9,11–14.
 L. 23–26.5 μm , B. 20–26.4 μm , and I. 4.5–7.5 μm . Sts. 23,36,40. Indonesia (Sumatra), Europe, S.America, Australia. New to Thailand.
 12. *A. suchlanii* Scott & Prescott Pl.33, f.9.
 Scott & Prescott 1961, 77, Pl.34, f.12.
 Lssp. 33 μm , Bcsp. 55 μm , and I. 14 μm . Sts. 37,38. Indonesia (Sumatra). New to Thailand.
 13. *A. sumatranum* Scott & Prescott Pl.29, f.4,5.
 Scott & Prescott 1961, 78, Pl.36, f.3,4.
 L. 15.4 μm , B. 13 μm , and I. 7.5–10 μm . Sts. 31,36,39,40. Indonesia (Sumatra). New to Thailand.
 14. *A. thailandicus* Hirano, sp. nov. Pl.32, f.7; Pl.33, f.10.
 Cellulae magnae, circiter 1.6 plo latiores quam longae sine spinis, profunde constrictae, sinu acute aperto; semicellulae late subtriangulares, apice convexo, angulis apicalibus cum spinis longis, robustis, inflexos directos productis, marginibus lateralibus paene

rectis; semicellulae in vertice visae angusto rhomboidae, lateribus convexis, polis obtusis cum spinis longis. Long. 40 μm , lat. 70.4 μm , lat. isthm. 13.2 μm . St. 43. Thailand.

Type: Pl.32, f.7; Pl.33, f.10. Loc. Botanical Garden, Chiangmai, Thailand.

Cells large, approximately 1.6 times broader than the length without spines, deeply constricted, sinus acutely open; semicells broadly subtriangular, apex convex, apical angles with a long, stout, incurved, downward-directed spine, lateral margin (lower lateral margin) almost straight; semicells in a vertical view narrow-rhomboidal, lateral margin convex, poles obtuse and with a long spine. L. 40 μm , Bssp. 70.4 μm , and I. 13.2 μm . St. 43.

15. *A. triangularis* Lagerh. Pl.33, f.5.
West 1911, 4, 97, Pl.114, f.11–13,17.
Lssp. 23–30 μm , B. 19–25 μm , and I. 5–7 μm . Sts. 18,19. Burma, Japan, Europe, U.S.A., Brazil. New to Thailand.
16. *A. validus* (W. & G.S.West) Scott & Grönblad Pl.31, f.3.
Scott & Grönblad 1957, Act. Soc. Sci. Fenn. II.B. 218, 29, Pl.17, f.16; Prescott et al. 1982, 2:4, 37, Pl.301, f. 10,12,13.
L. 26–27 μm , B. 24–26.4 μm , and I. 4.5–11 μm . Sts. 36,40,41. N. & S.America, Africa. New to Thailand.
1. *Staurostrum abruptum* W. & G.S.West Pl.49, f.3,4.
W. & G.S.West 1896, Trans. Linn. Soc. Bot. 5, 256, Pl.16, f.13; Prescott et al. 1982, 2:4, 116, Pl.329, f.6.
L. 33 μm , B. 19.8 μm , and I. 5.3 μm . Cells small, slightly broader than the length, deeply constricted, sinus open and acute; semicells subhexagonal, apex truncate and slightly retuse, apical angles broadly rounded, lateral margin slightly convex, lower lateral margin almost straight, semicells in vertical view triangular, apex convex and truncate, side view concave. St. 20. N. America. New to Thailand. This species from Thailand seems to be larger in size than that of the American forms.
2. *St. acanthastrum* W. & G.S.West Pl.43, f.1,2; Pl.48, f.1,2.
West 1902, Trans. Linn. Soc. Bot. 6, 183, Pl.22, f.1; Hirano 1959, Contr. Biol. Lab. Kyoto Univ. 9, 372, Pl.48, f.6,11; Scott & Prescott 1961, 85, Pl.42, f.1.
L. 31 μm , Bcpr. 79 μm , and I. 8.8 μm . Cells large, 5-radiate, deeply constricted at the middle, sinus open and acuminate at the extremity; semicells subglobose or fusiform, apex convex, angles produced into long, horizontal process, undulate and tapering to the apex, with 3 sharp spines disposed; vertical view of a semicel 5-radiate, processes long, tapering nodulated and 3 sharp spines at the extremity, body of a semicell with a ring of a pair of verucae at the base of process. Sts. 2,25,27. Ceylon, Indonesia (Java), Japan. New to Thailand.
3. *St. acanthocephalum* Skuja Pl.42, f.10.
Skuja 1949, Nov. Act. Reg. Soc. Sci. Upsal. IV, 14:5, 151, Pl.34, f.25; Scott & Prescott 1961, 85, Pl.52, f.5,6.

- Lssp. 39.6 μm , Bcsp. 48.5 μm , and I. 5.7 μm . St. 22. Burma, Indonesia (Borneo), Singapore. New to Thailand.
4. *St. apiculatum* Bréb. Pl.40, f.16,19.
West & Carter 1923, 5,6, Pl.129, f.6–8.
L. 15.4–20 μm , B. 15.4–20 μm , and I. 3.5–4.5 μm . Prescott et al. (1982) considered that this species is conspecific with *St. dejectum* var. *apiculatum* (Bréb.) Lund. Sts. 7,19,23,25,47,51. Burma, Thailand, Japan, Europe, U.S.A., Australia.
5. *St. archerii* West var. *archerii* Pl.50, f.5.
West 1892, Jour. Linn. Soc. Bot. 29, 183, Pl.23, f.15; West & Carter 1923, 5, 155, Pl.153, f.6,7; Prescott et al 1982, 2:4, 129, Pl.424, f.3.
Lcpr. 78 μm , Bcpr. 84 μm , and I. 24 μm . Cells large, twice longer than the breadth without process, moderately constricted at the middle; semicells cup shaped, apex convex and smooth, with 9 long processes projected beyond the apex and divergent. St. 25. Europe, U.S.A. New to Thailand.
- 5a. var. *curvatum* Hirano, var. nov. Pl.44, f.7,8.
Semicellulae in vertice visae 6-radiatae, processibus paene horizontalibus vel incurvatis, Long. 63.8 μm , lat. 88 μm , lat. isthm. 15.4 μm .
Type: Pl.44, f.7,8. Loc. Trang, Thailand.
Cells large, approximately 1.4–2 times broader than the length, median constriction shallow and retuse; semicells cup-shaped, apex straight or slightly concave, apical angles produce, many long nodulated and incurved processes, apex of a process with 3 small denticulations; semicells in a vertical view 6-radiate angles, producing long attenuated and nodulated processes, apex of semicell smooth. St. 20. The specimens from Thailand are somewhat smaller in size than the English form. They are separated from the typical form in number of processes. Thailand.
6. *St. arcuatum* Nordst. var. *pseudopisciforme* (Eichl. & Gutw.) W. & G.S. West
Prescott et al. 1982, 2:4, 131, Pl.374, f.4. Pl.40, f.12.
Lcpr. 40–70 μm , Bcpr. 35–52 μm , and I. 8–9 μm . Sts. 4,7,36,39,40. N.America. New to Thailand.
7. *St. asterias* Nygaard Pl.41, f.4.
Krieger 1932, 193, Pl.16, f.6; Skuja 1949, 153; Hirano 1959, 363, Pl.45, f.12.
L. 30 μm , B. 44 μm , and 4.5 μm . St. 31. Indonesia (Java, Sumatra, Bali). New to Thailand.
8. *St. bifidum* (Ehrenb.) Bréb. Pl.38, f.6.
West & Carter 1923, 5, 32, Pl.134, f.4; Skuja 1949, 154, Pl.33, f.18; Hirano 1959, Contr. 9, 313, Pl.40, f.2.
L. 33 μm , Bcsp. 35–44 μm , and I. 11–14 μm . Sts. 18,19,21. India, Ceylon, Burma, Thailand, Indonesia (Java, Sumatra), Japan, China, Europe.
9. *St. bigibbum* Skuja Pl.41, f.10.

- Skuja 1949, 154, Pl.34, f.28, 29; Scott & Prescott 1961, 86, Pl.53, f.8.
L. 11 μm , Bcpr. 22 μm , and I. 4 μm . St. 19. Burma, Indonesia (Borneo). New to Thailand.
10. *St. brachiatum* Ralfs Pl.40, f.1,3.
West & Carter 1923, 5, 88, Pl.141, f.14, 15, Pl.142, f.1–7; Skuja 1949, 155, Pl.34, f.24; Scott & Prescott 1961, 86, Pl.54, f.12; Pl.55, f.10.
Lcpr. 17.6 μm , Bcpr. 17.6 μm , and I. 5.7 μm . St. 36. Cosmopolitan.
11. *St. brebispinum* (Bréb.) Ralfs
Prescott et al. 1982, 2:4, 150, Pl.332, f.11,16.
L. 35 μm , B. 28.6 μm , I. 9 μm . Cells medium sized, approximately 1.2 times longer than the breadth, moderately constricted at the middle, sinus open and acuminate at the extremity; semicells broadly reniform or subelliptic, apex convex with a papilla or denticulation at the lateral margin; vertical view of a semicell triangular, sides slightly concave or almost straight, angles broadly rounded, with a papilla. St. 47. Cosmopolitan.
12. *St. burkillii* W. & G.S.West
W. & G.S.West 1907, Ann. Roy. Bot. Gard. Calcutta 6:2, 216, Pl.16, f.3.
L. 97–113 μm , B. 96–99 μm , I. 36 μm . St. 22. Burma. New to Thailand.
13. *St. calyxoides* Wolle var. *orientale* Scott & Prescott Pl.48, f.10,11.
Scott & Prescott 1961, 87, Pl.55, f.1,2.
Lssp. 22–24 μm , Bssp. 22–26 μm , and I. 12–13 μm . Cells moderate in size, moderately constricted at the middle, sinus moderately open; semicells obtrapeziform, lateral margins slightly retuse, apex somewhat convex, apical angles with a long, stout and almost erected but somewhat incurved spines; vertical view of a semicell hexagonal, sides straight, angles with a spine strongly curved in one direction. Sts. 36,39,40,41. Indonesia (Sumatra). New to Thailand.
14. *St. cerastes* Lund. var. *coronatum* Krieger Pl.43, f.5,6.
Krieger 1932, 194, Pl.19, f.5; Scott & Prescott 1961, 87, Pl.55, f.1,2; Hirano 1967, Nat. Life SE. Asia, 5, 64, Pl.14, f.1,2.
L. 35–37 μm , Bcpr. 35–44 μm , and I. 7.5–8.5 μm . Cells slightly broader than the length including processes, moderately constricted, sinus open acutely and apex acuminate; semicells campanulate, lateral margins inflated, apical angles produced into a long, strongly incurved process, verrucose in the upper margin and smooth in the lower margin. Sts. 7,35,36,39,40,41. Burma, Thailand, Indonesia (Sumatra).
- 14a. var. *pulchrum* Scott & Grönblad Pl.49, f.7.
Scott & Prescott 1957, Act. Soc. Fenn. II, B:8, 33, Pl.20, f.5; Scott & Prescott 1961, 87, Pl.56, f.7; Prescott et al. 1982, 2:4, 155, Pl.440, f.8.
L. 35 μm , Bcpr. 50.6 μm , and I. 8 μm . St. 23. Indonesia (Sumatra). New to Thailand.
15. *St. ceylanicum* W. & G.S.West

- W. & G.S. West 1902, 183, Pl.22, f.2; Krieger 1932, 195, Pl.16, f.5; Scott & Prescott 1961, 87, Pl.59, f.1.
 L. 23–26 μm , Bcpr. 28.6–31 μm , and I. 8.5 μm . Sts. 19,25. Ceylon, Indonesia (Java, Sumatra, Bali)
16. *St. clepsydra* Nordst. var. *obtusum* Nordst. Pl.37, f.8.
 Thomasson 1960, Nov. Act. Reg. Soc. Sci. Upsal. ser. IV. 17:12, 26, f.9:37.
 L. 35 μm , B. 38 μm , and I. 8.5 μm . St. 53.
17. *St. columbetoides* W. & G.S. West
 West 1902, Trans. Linn. Soc. Bot. 6, 186, Pl.22, f.8,9; Hirano 1959, Contr. 9, 351, Pl.44, f.1.
 Lspr. 13–15 μm , cpr. 53–66 μm , Bspr. 13–15 μm , cpr. 44–66 μm , and I. 4.5–8 μm . Sts. 19,24,36. Ceylon, Japan. New to Thailand.
18. *St. connatum* (Lund.) Roy & Bisset Pl.49, f.8.
 West & Carter 1923, 5, 15, Pl.130, f.6–8; Krieger 1932, 195, Pl.14, f.4; Scott & Prescott 1961, 88, Pl.53, f.12.
 Lssp. 20–33 μm , Bssp. 21–29.5 μm , and I. 6.5–11 μm . Sts. 19,31,53. Burma, Ceylon, Indonesia (Sumatra), Philippines, Japan, Europe, N.America, Africa, Australia.
19. *St. contectum* Turner Pl.39, f.2.
 Turner 1892, 25, 111, Pl.15, f.20; Krieger 1932, 195, Pl.18, f.15; Scott & Prescott 1961, 88, Pl.54, f.6.
 L. 27.7 μm , B. 44 μm , and I. 12 μm . Semicells obtriangular, lateral margin slightly convex, apex concave, apical angles with a pair of sharp spines and with a slender process just below the spines. St. 49. India, Burma, Indonesia (Sumatra). New to Thailand.
20. *St. corniculatum* Lund. var. *spinigerum* West Pl.47, f.17.
 West 1892, Jour. Linn. Soc. Bot.29, 171, Pl.22, f.12; West 1911, 4, 164, Pl.125, f.19–22; Prescott et al. 1982, 2:4, 166, Pl.336, f.6.
 Lssp. 26.4 μm , Bssp. 19.8 μm , and I. 12.3 μm . This variety is similar to *St. unguiferum* Turner var. *inerme* (Turner) West. However it differs from the latter by a small form. St. 30. Europe, Australia, New Zealand. New to Thailand.
- 20a. var. *variabile* Nordst. Pl.38, f.2; Pl.47, f.22,23.
 Krieger 1932, 196, Pl.15, f.2; Scott & Prescott 1961, 88, Pl.54, f.1–4; Prescott et al. 1982, 2:4, 166, Pl.336, f.8.
 L. 26.4 μm , B. 20–40 μm , and I. 10–15 μm . Cells moderate in size, deeply constricted at the middle, sinus open, acute and acuminate at the extremity; semicells obversely lunate, apex slightly convex, lateral margin convex and retuse at the middle of the margin, apical angles with a sharp and diverging spine; vertical view of a semicell triangular, angles rounded and with a spine, sides concave. Sts. 19,26,31,43,53. Indonesia (Java, Sumatra, Bali). New to Thailand.

21. *St. crenulatum* (Näg.) Delp. Pl.40, f.10; Pl.42, f.11.
 West & Carter 1923, 5, 110, Pl.143, f.9–13; Hirano 1959, Contr. 9, 349, Pl.43, f.18;
 Prescott et al. 1982, 2:4, 169, Pl.409, f.5,8,10,12.
 L. 26.4–28.6 μm , B. 28.6–33 μm , and I. 6.5–9 μm . St. 7. Indonesia (Java), Nepal,
 Japan, Europe, U.S.A., Africa. New to Thailand.

22. *St. curvatum* W. West Pl.36, f.9; Pl.49, f.9,10,13.
 West & Carter 1923, 5, 1, Pl.130, f.15,16; Hirano 1959, Contr. 9, 307, Pl.40, f.14;
 Scott & Prescott, 1961, 88, Pl.41, f.4; Prescott et al. 1982, 2:4, 171, Pl.354, f.1,3.
 L. 23–31 μm , B. 22–35 μm , and I. 5.3–7.5 μm . St. 19. Indonesia (Sumatra),
 Europe, S. America.

23. *St. cuspidatum* Bréb. var. *cuspidatum* Pl.37, f.6.
 West & Carter 1923, 5, 23, Pl.132, f.13–15; Krieger 1932, 196, Pl.14, f.7; Scott &
 Prescott 1961, 89, Pl.53, f.13; Prescott et al. 1982, 2:4, 173, Pl.347, f.1,3.
 Lssp. 20–46 μm , Bssp. 17–35 μm , and I. 3.5–7.5 μm . Sts. 7,20,26,28,32,35,36,39.
 Burma, Ceylon, Nepal, Indonesia (Java), N. America, Brazil, Australia, New Zealand.
 New to Thailand.

- 23a. var. *divergens* Nordst. Pl.38, f.12; Pl.47, f.13,14.
 West 1923, 5, 25, Pl.132, f.16,17; Krieger 1932, 197, Pl.14, f.9; Scott & Prescott 1961,
 89, Pl.53, f.15; Prescott et al. 1982, 2:4, 174, Pl.348, f.5,6,11.
 Lssp. 22–28.6 μm , Bssp. 22–28.6 μm , and I. 5–6 μm . Semicells cup-shaped,
 isthmus elongated, sinus broadly rounded, spines divergent. The specimens examined
 from Thailand show some variations in size (small form l. 22 μm , b. 22 μm ; large form
 l. 31–35 μm , b. 26–28.6 μm without spine). Scott & Prescott reported f. *minus* from
 Sumatra without a description of the size. Sts. 26,49,51. Indonesia (Java, Bali),
 Europe. New to Thailand.

24. *St. cyclofurcatum* Scott & Grönblad Pl.42, f.13; Pl.43, f.14,15.
 Scott & Grönblad 1957, Acta Soc. Sci. Fenn. II, B:2, 35, Pl.21, f.11–13; Prescott et
 al. 1982, 2:4, 177, Pl.436, f.2.
 Lspr. 31–34.3 μm , Bcpr. 36.5–57 μm , and I. 9–11 μm . Cells moderate in size,
 approximately twice times broader than the length including process, moderately con-
 stricted at the middle, sinus open and acute at the extremity; semicells subfusiform, ven-
 tral margin slightly convex, dorsal margin convex, apical angles produced into long, den-
 ticulated and slightly tapering process, process almost horizontal and extremity with 3
 sharp spines, apex of a semicell with short spinous processes; vertical view of a semicell
 triangular, sides almost straight or slightly concave, angles produced to form a long, un-
 dulate process, with a pair of short verrucae at the base of a long process. Sts. 26,58.
 U.S.A. New to Thailand.

25. *St. cyrtocerum* Bréb.
 West & Carter 1923, 5, 135, Pl.149, f.9, Pl.150, f.4; Prescott et al. 1982, 2:4, 178,
 Pl.440, f.1,3; Pl.441, f.1.

- L. 33 μm , Bcpr. 44 μm , and I. 8.5 μm . St. 32. Europe, N. & S.America, Australia. New to Thailand.
26. *St. dejectum* Bréb. Pl.37, f.9.
West & Carter 1923, 5, 7, Pl.129, f.9–12; Scott & Prescott 1961, 89, Pl.53, f.10.
L. 20–24 μm , Bspr. 22–28.6 μm , and I. 5–8.8 μm . Sts. 35,47. Cosmopolitan. New to Thailand.
27. *St. dentatum* Krieger Pl.40, f.7.
Krieger 1932, 197, Pl.16, f.20; Scott & Prescott 1961, 89, Pl.59, f.8 (forma).
L. 14.5 μm , Bcpr. 26.4–30 μm , and I. 4.5–7 μm . Sts. 39,40. Indonesia (Sumatra). New to Thailand.
28. *St. diacanthum* Lemaire
Prescott et al. 1982, 2:4, 183, Pl.432, f.8.
L. 25 μm , Bcpr. 31.7 μm , and I. 8 μm . Sts. 36,39,41. Ceylon, Europe, U.S.A. New to Thailand.
29. *St. dickiei* Ralfs f. *longispinum* Fritsch & Rich Pl.39, f.3.
Scott & Prescott 1961, 89, Pl.41, f.5.
L. 36.5 μm , Bssp. 30 μm , and I. 11 μm . St. 47. Indonesia (Sumatra). New to Thailand.
- 29a. var. *circularis* Turner Pl.47, f.11
West & Carter 1923, 5, 5, Pl.129, f.16; Krieger 1932, 197, Pl.14, f.15; Prescott et al. 1982, 2:4, 186, Pl.347, f.10.
L. 26.4 μm , B. 29.5 μm , and I. 7.5 μm . St. 23. India, Indonesia (Sumatra), Japan, Europe, U.S.A., Africa.
30. *St. disputatum* W. & G.S.West var. *sinense* (Lütk.) W. & G.S.West Pl.47, f.18.
West 1911, 4, 176, Pl.126, f.19; Krieger 1932, 198, Pl.15, f.7; Skuja 1949, 157, Pl.36, f.1,2.
L. 21–22 μm , B. 20–24 μm , and I. 6–6.5 μm . Sts. 29,32. Burma, Indonesia (Sumatra), Japan, Europe, S.America, Africa, New Zealand. New to Thailand.
31. *St. duacense* W. & G.S.West Pl.41, f.2.
West & Carter 1923, 5, 116, Pl.148, f.1; Prescott et al. 1982, 2:4, 191, Pl.395, f.6.
L. 39.6 μm , Bcpr. 66 μm , and I. 8.6 μm . Sts. 31,32. Japan, Europe, N.America. New to Thailand.
32. *St. ensiferum* Turner Pl.47, f.4.
Turner 1892, 109, Pl.14, f.22; Hirano 1959, Contr. 9, 313, Pl.40, f.19.
Lspr. 36 μm , Lcpr. 50 μm , Bspr. 30 μm , Bcpr. 43 μm , and I. 13 μm . St. 19. India, Ceylon. New to Thailand.
33. *St. excavatum* W. & G.S.West Pl.41, f.8; Pl.47, f.19.
West 1895, Trans. Linn. Soc. Bot. II:5, 78, Pl.8, f.42; Skuja 1949, 157, Pl.34, f.19,20;

Hirano 1959, Contr. 9, 354, Pl.44, f.15.

Lspr. 13–15.4 μm , Lcpr. 46–53 μm , Bspr. 11–19 μm , Bcpr. 46–53 μm , and I. 4–5 μm . Cells small, moderately constricted at the middle, sinus open and acuminate at the extremity; semicells cup-shaped, apex excavated, apical angles produced into a process divergent, nodulated and non-tapering, apex trispinose. Sts. 19,20,23,31,32. Japan, U.S.A., S.America, Africa, Madagascar, Australia.

34. *St. floriferum* W. & G.S.West

West 1896, Trans. Linn. Soc. Bot. 5, 267, Pl.18, f.1; Krieger 1932, 199, Pl.19, f.6; Prescott et al. 1982, 2:4, 198, Pl.438, f.2.

Lspr. 23 μm , Bspr. 20 μm , Bcpr. 53 μm , and I. 7 μm . Semicells cup-shaped, sinus open and acuminate at the extremity, apical angles produced into a process horizontal, slightly attenuated to the extremity, trispinose, apex truncate and undulate; vartical view of a semicell triangular, sides slightly concave, roughly nodulated, with pair of emarginate verrucae. Sts. 32,35. Indonesia (Sumatra, Bali), Europe, N.America, Africa. New to Thailand.

35. *St. freemanii* W. & G.S.West var. *nudiceps* Scott & Prescott Pl.38, f.1,8.
Scott & Prescott 1961, 92, Pl.43, f.3.

Lssp. 28.6–33 μm , Lcsp. 53–61.6 μm , Bssp. 27.3–35 μm , Bcsp. 53–61.6 μm , and I. 10–11 μm . Sts. 18,19,21. Indonesia (Sumatra, Borneo). New to Thailand.

35a. var. *triquetrum* W. & G.S.West Pl.38, f.7; Pl.49, f.1.

West 1902, Trans. Linn. Soc. Bot. 6, 177, Pl.21, f.22; Scott & Prescott, 1961, 92, Pl.43, f.2.

L. 33 μm , B. 31.7 μm , and I. 11 μm . St. 20. Ceylon, Indonesia (Sumatra, Borneo). New to Thailand.

36. *St. furcatum* (Ehrenb.) Bréb. var. *asymmetricam* Grönblad Pl.51, f.17.

Krieger 1932, 199, Pl.17, f.11; Prescott et al. 1982, 2:4, 204, Pl.378, f.5; Pl.379, f.1,2,10.

Lcpr. 26.4 μm , Bcpr. 22 μm , and I. 7 μm . Sts. 25,47. India, Indonesia (Sumatra), Japan, Europe, Australia. New to Thailand.

37. *St. gemelliparum* Nordst.

West 1902, 179, Pl.21, f.25; Hirano 1955, Fauna Flora Nepal Himalaya vol.1, 29, Pl.5, f.8; Prescott et al. 1982, 2:4, 209, Pl.382, f.4.

Lcpr. 27 μm , Bcpr. 22 μm , and I. 8 μm . St. 25. Ceylon, Nepal, Japan, N. & S.America. New to Thailand.

38. *St. gladiosum* Turner

West & Carter 1923, 5, 57, Pl.137, f.1,2; Krieger 1932, 199, Pl.15, f.14; Scott & Prescott 1961, 93, Pl.56, f.1.

L. 36 μm , B. 31 μm , and I. 7 μm . St. 44. India, Indonesia (Java, Sumatra), Europe, U.S.A., Africa. New to Thailand.

39. *St. gracile* Ralfs var. *gracile* Pl.40, f.9.
West & Carter 1923, 5, 96, Pl.144, f.3–7; Krieger 1932, 199, Pl.18, f.11; Prescott et al. 1982, 2:4, 212, Pl.412, f.8–10, Pl.413, f.1,2.
L. 26.4 μm , Bcpr. 48.4 μm , and I. 8 μm . Sts. 32,36,41. Ceylon, Burma, Indonesia (Sumatra, Bali), Japan, Europe, Africa, Australia. New to Thailand.
- 39a. var. *coronulatum* Boldt Pl.43, f.9,10.
West & Carter 1923, 5, 100, Pl.144, f.10; Prescott et al. 1982, 2:4, 213, Pl.413, f.3,4.
L. 23–26.4 μm , Bcpr. 35–53 μm , and I. 8–8.6 μm . Cells medium size, slightly constricted at the middle, sinus widely open and acuminate at the extremity; semicells campanulate, apex almost straight and with a pair of verrucae, apical angles produced into a long, horizontal or slightly divergent process terminated in minute spines; semicells in vertical view tetra-angular, side concave, angles produced into process, long, slender, and non-tapering, denticulated, inside of margin with a pair of granules in each base of a process. Sts. 7,36,40. Europe, U.S.A., Africa. New to Thailand.
- 39b. var. *elongatum* Scott & Prescott
Scott & Prescott 1961, 94, Pl.57, f.10.
L. 40 μm , Bcpr. 62 μm , and I. 8 μm . St. 25. Indonesia (Sumatra), New to Thailand.
- 39c. var. *gracile* f. *kriegeri* Scott & Prescott Pl.41, f.13.
Scott & Prescott 1961, 94, Pl.57, f.11.
L. 19.4 μm , Bcpr. 25.5 μm , and I. 7 μm . Semicells cup-shaped, sinus acute or acuminate, outer part widely open; apex of semicell slightly convex, processes relatively short, apex with 3 denticulations. Sts. 30,32. Indonesia (Java, Sumatra). New to Thailand.
- 39d. var. *nanum* Wille Pl.40, f.15.
West & Carter 1923, 5, 100, Pl.144, f.8,9; Prescott et al. 1982, 2:4, 213, Pl.413, f.9,10.
L. 27.7 μm , Bcpr. 33 μm , and I. 8.6 μm . Cells smaller than those of the typical form; semicells cup-shaped, apex convex and smooth, process relatively short, nearly horizontal or slightly convergent, margin of a process nodulated; vertical view 3-angular, sides concave. St. 32. Ceylon, Europe. New to Thailand.
- 39e. var. *ornatum* Krieger Pl.40, f.13; Pl.41, f.12.
Krieger 1932, 200, Pl.18, f.13.
L. 24 μm , Bcpr. 47 μm , and I. 5.5 μm . Sts. 23,25. Indonesia (Sumatra). New to Thailand.
40. *St. hantzii* Reinsch var. *japonicum* Roy & Bisset Pl.48, f.15.
Roy & Bisset 1886, Journ. Bot. 24, 240, Pl.268, f.5; Hirano 1959, Contr. 9, 380, Pl.51, f.10,11.
Lspr. 26.4–35.2 μm , Lcpr. 46–66 μm , Bcpr. 35–64 μm , Bspr. 20–22 μm , and I. 12.3–13 μm . Sts. 24,27,28. Japan. New to Thailand.
41. *St. heimerlianum* Lütke. var. *sumatranum* Scott & Prescott Pl.40, f.2; Pl.49, f.16.

Scott & Prescott 1961, 95, Pl.56, f.10.

L. 22 μm , Bcpr. 35 μm , and I. 5.7 μm . Cells small, 1.6 times broader than the length including processes, sinus open acutely; semicells subfusiform, apex slightly convex, apical angles produced into the process almost horizontal or slightly and divergently curved near the apices, margins of a process furnished with short denticulations St. 19. Indonesia (Sumatra). New to Thailand.

42. *St. hexacerum* (Ehrenb.) Wittr. f. *hexacerum* Pl.40, f.6.
West & Carter 1923, 5, 138, Pl.142, f.11–14; Prescott et al. 1982, 2:4, 220, Pl.401, f.10,11.

L. 22 μm , B. 26.4 μm , and I. 6.5 μm . St. 2. Cosmopolitan. New to Thailand.

- 42a. f. *pentagona* Krieger Pl.42, f.9.
Krieger 1932, 201, Pl.16, f.18.
L. 26.4 μm , B. 30.8 μm , and I. 8.8 μm . St. 43. Burma, Indonesia (sumatra). New to Thailand.

43. *St. horametrum* Roy & Bisset var. *orientale* Scott & Prescott Pl.47, f.1.
Scott & Prescott, 1961, 95, Pl.56, f.3.

L. 29.5–33 μm , B. 26.4–27.7 μm , and I. 7.5–8.8 μm . Cells of a little less than a medium size, 2.6 times broader than the length, moderately constricted, sinus almost rectangularly open; semicells 4-angular, sides concave, angles slightly produced and with 2 rows of denticulations around near a process. Sts. 28,29. Indonesia (Sumatra). New to Thailand.

44. *St. hystrix* Ralfs Pl.37, f.5.
West & Carter 1923, 5, 60, Pl.136, f.1; Prescott et al. 1982, 2:4, 221, Pl.362, f.4.
L. 23.3 μm , B. 19.8 μm , and I. 13 μm . Sts. 39,40,41. Japan, Europe, U.S.A., Brazil. New to Thailand.

45. *St. inconspicuum* Nordst. var. *crassum* Gay Pl.49, f.11
West & Carter 1923, 5, 87, Pl.141, f.8; Krieger 1932, 201, Pl.16, f.21; Prescott et al. 1982, 2:4, 224, Pl.390, f.15.
L. 12.3–15.4 μm , B. 12.3–14 μm , and I. 4.5 μm . Sts. 19,25,53. Japan, Indonesia (Sumatra). New to Thailand.

46. *St. indentatum* W. & G.S.West Pl.4.5, f.3,4.
West 1902, Trans. Linn. Soc. Bot. 6, 257, Pl.22, f.10–12; Skuja 1949, 158, Pl.35, f.14–16; Scott & Prescott 1961, 96, Pl.50, f.6,7.

L. 37.4–42 μm , Bcsp. 60–79 μm , and I. 6.5–8.5 μm . Cells biradiate, 1.6 times broader than the length including a process, shallowly constricted at the middle, sinus acutely open; semicells campanulate, basal part inflated, apex slightly convex and with emarginate verrucae, apical angles produced into a long, somewhat convergent, denticulated process and ends minutely spinated, base of a process of the ventral margin with a or 2 emarginate verrucae, Sts. 19,24,32. Ceylon, Burma. New to Thailand.

46a. forma *minus* Scott & Prescott

Scott & Prescott 1961, 96, Pl.50, f.8,9.

L. 35 μm , Bcpr. 66 μm , and I. 11 μm . Semicells campanulate, 1.9 times broader than the length including processes, apex slightly convex and with 6–8 emarginate verrucae, basal part of a semicell inflated and 2 emarginate verrucae disposed, angles produced into a process long, horizontal or slightly incurved, apical verrucae gradually become undulate in the apex. St. 27. Indonesia (Java, Borneo). New to Thailand.

47. *St. inflexum* Bréb.

West & Carter 1923, 5, 108, Pl. 143, f.7,8; Skuja 1949, 158, Pl.35, f.2; Prescott et al. 1982, 2:4, 224, Pl.441, f.3,5,8.

L. 22–33 μm , Bcpr. 31–44 μm , and I. 6.5–8 μm . Sts. 19,24,32,51. Japan, Europe, N.America. New to Thailand.

48. *St. javanicum* (Nordst.) Turner var. *apiculiferum* (Turner) Krieger Pl.44, f.11,12.
Krieger 1932, 201, Pl.20, f.3; Scott & Prescott 1961, 97, Pl.44, f.6.

L. 48–66 μm , Bcpr. 79–101 μm , and I. 6.5–15.4 μm . Cells large, 1.4 times broader than the length including processes, moderately constricted at the middle; semicells cup-shaped, apex straight and verrucose, verrucae 4, apical angles produced into a process, process long, denticulated and tapering toward the extremity, and with a spine, base of a process with verrucae on the ventral margin, dorsal margin of a process verrucose at the base and verrucae becoming dentated toward the apex, ventral side of a process undulate at the end; vertical view of a semicell triangular, sides almost straight or scarcely concave, with a series of verrucae within the sides of the body, margin of process undulate and with denticulations instead of verrucae. Sts. 1,7,10,25,35,36,39, 40,41,51. Indonesia (Java, Sumatra), Japan. New to Thailand.

49. *St. leptodermum* Lund. var. *ikapoe* (Schmidle) W. & G.S. West Pl.37, f.4.
West 1907, Ann. Roy. Bot. Gard. Calcutta 6, 213, Pl.16, f.8.

Lssp. 24–31 μm , Lcsp. 26.4–39.6 μm , Bssp. 24–25 μm , Bcsp. 26–39 μm , and I. 9–11 μm , Sts. 9,39. Burma. New to Thailand.

49a. f. *minor* Lütkem.

Lütkemüller 1900, Ann. k.k. Nat. Hist. Hofm. 15, 123, Pl.6, f.30,31; Skuja 1949, 158, Pl.34, f.18; Hirano, 1959, Contr.9, 308, Pl.39, f.17.

Lssp. 28–31 μm , Lcsp. 33–39 μm , Bssp. 24–26.4 μm , Bcsp. 26.4–27.3 μm , and I. 8–10 μm . Sts. 1,4,35,36,40. China, Burma, Japan. New to Thailand.

50. *St. leptopus* Krieger var. *variabile* Skuja Pl.40, f.4, Pl.46, f.1.
Skuja 1949, 159, Pl.34, f.12,23.

Lssp. 22–26.4 μm , Lcsp. 53–85 μm , Bssp. 13 μm , Bcsp. 66–85 μm , and I. 5.7–7.5 μm . Sts. 18,19. Burma. New to Thailand.

51. *St. leptocladum* Nordst. Pl.45, f.7.

Smith 1924, Wisc. Bull. 57, 102, Pl.78, f.1–7; Hirano 1959, Contr. 9, 377, Pl.50, f.6; Prescott et al. 1982, 2:4, 234, Pl.406, f.2,3.

Lspr. 36–39 μm , Lcpr. 105 μm , Bcpr. 97–105 μm , and I. 6.5–8 μm . Sts. 19,32,38. Cosmopolitan. New to Thailand.

52. *St. limneticum* Schm. var. *burmense* W. & G.S.West Pl.44, f.1,9.
 West 1907, Ann. Roy. Bot. Gard. Calcutta 6, 222, Pl.16, f.13; Hirano 1959, Contr. 9, 372, Pl.49, f.6–8; Scott & Prescott 1961, 97, Pl.42, f.2,3.
 Lspr. 26.4–29.5 μm , Lcpr. 48.4–66 μm , Bspr. 17.6 μm , Bcpr. 66–97 μm , and I. 8–9 μm . Sts. 18,31. Burma, Indonesia (Borneo, Sumatra, Bali), N. & S.America. New to Thailand.
53. *St. longispinum* (Bréb.) Arch.
 West & Carter 1923, 5, 33, Pl.134, f.1.
 Lcsp. 90 μm , Bcsp. 72 μm , and I. 36 μm . St. 7. India, Europe, U.S.A., Australia. New to Thailand.
54. *St. lunatum* Ralfs var. *planktonicum* W. & G.S.West Pl.46, f.2.
 West & Carter 1923, 5, 30, Pl.133, f.20–22; Prescott et al. 1982, 2:4, 244, Pl.355, f.3,5.
 L. 25–29.5 μm , B. 20.6–26.4 μm , and I. 11 μm . Sts. 39,41. Europe, N. America, Africa, New Zealand. New to Thailand.
55. *St. margaritaceum* (Ehrenb.) Ralfs var. *margaritaceum* Pl.47, f.2.
 West & Carter 1923, 5,131, Pl.150, f.5–9; Prescott et al. 1982, 2:4, 240, Pl.390, f.1,3; Pl.391, f.1,2.
 L. 24–28.6 μm , B. 20–30 μm , and I. 9–11 μm . Sts. 3,28,39. Cosmopolitan. New to Thailand.
- 55a. var. *gracilius* Scott & Prescott
 Scott & Prescott 1961, 97, Pl.59, f.16; Prescott et al. 1982, 2:4, 240, Pl.391, f.3.
 L. 23 μm , B. 25 μm , and I. 6 μm . St. 22. Indonesia (Java, Sumatra), U.S.A., Africa. New to Thailand.
56. *St. megacanthum* Lund. var. *megacanthum*
 West & Carter 1923, 5, 20, Pl.131, f.7.8; Krieger 1932, 203, Pl.15, f.1; Scott & Prescott 1961, 97, Pl.55, f.3 (forma); Prescott et al. 1982, 250, Pl.351, f.1,3.
 L. 26.4 μm , B. 30.5 μm , and I. 8 μm . St. 44. Cosmopolitan. New to Thailand.
- 56a. var. *orientale* Scott & Prescott Pl.38, f.5.
 Scott & Prescott 1961, 98, Pl.55, f.5,6.
 L. 31–35 μm , B. 37.4 μm , and I. 6.5–7.5 μm , Sts. 21,51. Indonesia (Sumatra). New to Thailand.
57. *St. micron* W. & G.S.West
 West & Carter 1923, 5, 123, Pl.149, f.6; Krieger 1932, 203, Pl.17, f.9 (forma); Prescott et al. 1982, 2:4, 251, Pl.426, f.3,5.
 L. 16.7–22 μm , B. 22 μm , and I. 4.5–7 μm . Sts. 19,53. Japan, Europe, U.S.A., Africa. New to Thailand.

58. *St. modestum* Behre
Behre 1956, Arch. Hydrobiol. Suppl. 23, 75, Pl.8, f.5a-d.
L. 15.4 μm , B. 20–21 μm , and I. 6.5–7.5 μm . Sts. 25,31. Celebes, Philippines. New to Thailand.
59. *St. mucronatum* Ralfs var. *subtriangulare* W. & G.S. West Pl.38, f.3,4.
West & Carter 1923, 5,12, Pl.130, f.13,14.
L. 27.3 μm , Bssp. 27.3 μm , and I. 7 μm . Cells slightly longer than the breadth, deeply constricted at the middle, sinus widely open and extremely acute; semicells obversely triangular, lateral margins convex, apical angles with a short spine, spine divergent. Sts. 26,43. Burma, Europe. New to Thailand.
60. *St. muticum* Bréb. Pl.47, f.6.
West 1911, 4, 133, Pl.118, f.16–20; Scott & Prescott 1961, 99, Pl. 52, f.11; Prescott et al. 1982, 2;4, 257, Pl.331, f.1,2,4,5.
L. 25–39 μm , B. 14–35 μm , and I. 8.5–11 μm . Sts. 32,51. Indonesia (Java), Australia. New to Thailand.
61. *St. o-meari* Arch. Pl.44, f.2,3
West & Carter 1923, 5, 13, Pl.132, f.5–8; Prescott et al. 1982, 2;4, 265, Pl.350, f.1,3,6,7.
L. 20 μm , Bssp. 20 μm , and I. 8 μm . Semicells obversely triangular, constriction deep and widely open, apex straight, apical angles with a diverging spine, lateral margin almost straight. St. 31. Europe, S.America. New to Thailand.
62. *St. orbiculare* Ralfs var. *depressum* Roy & Bisset Pl.47, f.12.
Roy & Bisset 1886, Journ. Bot. 24, 234, Pl.268, f.14; Hirano 1959, Contr. 9, 290, Pl.37, f.18; Scott & Prescott 1961, 100, Pl.52, f.12.
L. 31 μm , B. 31 μm , and I. 8.5 μm . St. 19. Indonesia (Java, Borneo, Sumatra) Thailand, Japan, Europe, Australia.
- 62a. var. *hibernicum* W. & G.S. West Pl.38, f.11.
West 1911, 4, 156, Pl.124, f.5–9; Prescott et al. 1982, 2;4, 269, Pl.331, f.11,12.
L.31 μm , B. 26.4 μm , I. 6.5 μm . St. 10. Japan, Europe. New to Thailand.
- 62b. var. *ralfsii* W. & G.S. West
West 1911, 4, 156, Pl.124, f.12,13,15,16.
L. 37.4 μm , B. 33 μm , I. 8.5 μm . St. 51. Cosmopolitan. New to Thailand.
63. *St. pachyrhynchiforme* Hirano, sp. nov. Pl.51, f.15,16.
Cellulae mediocres, circiter latiores quam longae, profunde constrictae ad extremum, sinu acute aperto; semicellulae obtriangulares, apice recto vel leviter concavo, angulis leviter productis et late rotundis, marginibus leviter convexis; membrana punctata sed glabris ad apicem; semicellulae in vertice visae triangulares, marginibus profunde concavis, angulis truncatis et rotundatis; long. 39.6 μm , lat. 44 μm , lat. isthm. 13.2 μm . St. 19.

Type: Pl.51, f.15,16. Loc. Phuket Island, Thailand.

Cells of medium size, slightly broader than the length, deeply constricted, sinus acutely open; semicells obtriangular, apex straight or slightly concave, angles somewhat produced and broadly rounded, lateral margin slightly convex; cell wall punctated, punctations formed cover around the base of process, but apical part smooth; semicells in a vertical view triangular, side view deeply concave, angles truncate and rounded. L. 39.6 μm , B. 44 μm and I. 13.2 μm . St. 19. Thailand. This species resembles to *St. pachyrhynchum* but it is separated from the latter in having non-thickened angles, punctated cell wall and a smooth shape in the apical part.

64. *St. perundulatum* Grönblad Pl.48, f.6.
Grönblad 1920, Acta Soc. pro Fauna Flora Fenn. 47:4, 73, Pl.3, f.68,69; Scott & Prescott 1961, 101, Pl.52, f.9 (forma).
Lspr. 11.8 μm , Lcpr. 28.6 μm , Bcpr. 31 μm , and I. 5.3 μm . St. 31. Indonesia (Sumatra, Bali). New to Thailand.
65. *St. pileolatum* Bréb.
West 1911, 4, 127, Pl.118, f.11–13; Hirano 1059, Contr. 9, 284, Pl.37, f.5.
L. 26.4 μm , B. 13.2 μm , and I. 10 μm . St. 40. Japan, Europe, Brazil. New to Thailand.
66. *St. pinnatum* Turner var. *floridense* Scott & Grönblad
Scott & Grönblad 1957, Act. Soc. Sci. Fenn. II, B:2, 44, Pl.25, f.13–17.
L. 37.4 μm , B. 46.2 μm , and I. 11 μm . St. 20. U.S.A. New to Thailand.
- 66a. var. *hydea* Krieger Pl.42, f.12.
Krieger 1932, 204, Pl.16, f.8.
L. 24.2 μm , B. 28.6 μm , and I. 8.8 μm . St. 43. Indonesia (Java). New to Thailand.
- 66b. var. *subpinnatum* (Schm.) W. & G.S.West f. *robustum* Krieger Pl.42, f.5,6.
Krieger 1932, 205, Pl.16, f.7; Scott & Prescott 1961, 101, Pl.46, f.9,10.
L. 35–44 μm , B. 44–53 μm , and I. 10–13 μm . Sts. 23,25,43,51. Indonesia (Java, Sumatra, Bali). New to Thailand.
67. *St. polymorphum* Bréb. Pl.40, f.11.
West & Carter 1923. 5, 125, Pl. 142, f.24, Pl.143, f.1–3; Scott & Prescott 1961, 102, Pl.59, f.14 (forma); Prescott et al. 1982, 2:4, 282, Pl.401, f.1,8,9.
L. 22.5 μm , B. 25–33 μm , and I. 6.5–8 μm . Sts. 26,30,36,41. Indonesia (Borneo, Sumatra), Europe. Cosmopolitan.
68. *St. praenii* W. & G.S.West var. *majus* Hirano, var. nov. Pl.39 f.9.
Var. major; semicellulae a fronte visae late ellipticae, angulis lateralibus late rotundatis et spinis conicis praeditis; a vertice visae polis late rotundatis, cum spinis conicis praeditis, lateribus paullo concavis, Long. 127.6 μm , lat. 105.6 μm , lat. isthm. 39.6 μm . St. 47.
Type: Pl.39, f.9. Loc. Non Boa Saket, Thailand.

Cells large; semicells broadly elliptic, lateral angles broadly rounded, with a spine conically disposed; semicells in a vertical view broadly rounded with a short spine, side view slightly concave. L. 127.6 μm , B. 105.6 μm , and I. 39.6 μm . St. 47.

69. *St. protectum* W. & G.S. West var. *rangoonense* (Skuja) Scott & Prescott
Pl.47, f.5; Pl.49, f.5.

Scott & Prescott 1961, 103, Pl.44, f.1,2.

L. 31 μm , B. 38.3 μm , and I. 13 μm . St. 32. Indonesia (Borneo). New to Thailand.

70. *St. pseudosebaldi* Wolle var. *simplius* West Pl.41, f.3.

Hirano 1959, Contr. Biol. Lab. Kyoto Univ. 9, 365, Pl.46, f.9; Prescott et al. 1982, 2:4, 290, Pl.442, f.2

L. 37.4 μm , Bcpr. 44 μm , and I. 8.5 μm . Cells of a little less than medium size, approximately 1.2 times broader than the length; semicells cup-shaped, apex slightly convex, process short and slightly divergent; semicells in a vertical view triangular, margin slightly concave, intramarginal verrucae form reduced to simple short spines. Sts. 13,23. Japan, Europe, U.S.A. New to Thailand.

71. *St. pseudotetracerum* (Nordst.) W. & G.S. West Pl.44, f.6.

West 1895, Trans. Linn. Soc. Bot. II, 5:5, 79, Pl.8, f.39; West & Carter 1923, 5, 122, Pl.149, f.11; Hirano 1959, Contr. Biol. Lab. Kyoto Univ. 9, 347, Pl.43, f.17.

L. 18.5 μm , B. 22 μm , and I. 5.7 μm . Cells small, slightly broader than the length, sinus open and rectangular; semicells cuneate, apex slightly convex, process short, slightly curved upward, and denticulated; vertical view of a semicell triangular, sides concave. St. 22. Ceylon, Indonesia (Borneo), Europe, U.S.A., Africa. New to Thailand.

72. *St. pseudozonatum* Borge var. *sumatranum* Krieger Pl.48, f.12,16.

Krieger 1932, Arch. Hydrobiol. Suppl.11, 205, Pl.16, f.4.

Lcpr. 35–48 μm , Bcpr. 35 μm , and I. 8.8–13 μm . Sts. 4,19,39. Indonesia (Sumatra). New to Thailand.

73. *St. pterosporum* Lund. Pl.40, f.17.

Lundell 1871, Nov. Act. Reg. Soc. Upsal. III:8, 60, Pl.3, f.29; West & Carter 1923, 5, 14, Pl.132, f.1–4; Prescott et al. 1982, 2:4, 292, Pl.353, f.12.

L. 22 μm , B. 23 μm , and I. 9 μm . Cells small, as long as the breadth, moderately constricted, sinus widely open; semicells cuneate, lateral margin straight or slightly convex, apical angles with a short spine; semicells in a vertical view triangular, sides straight or slightly concave, angles with a spine. St. 47. Europe, S.America, Australia, New Zealand. New to Thailand.

74. *St. punctulatum* Bréb. var. *punctulatum*

West 1911, 4, 179, Pl.127, f.8–11, 13,14; Prescott et al. 1982, 2:4, 292, Pl.339, f.16.

L. 22–31 μm , B. 26.4–35 μm , and I. 6.5–6 μm . Sts. 10,12,13,23,26,32,37. Indonesia (Sumatra). Cosmopolitan.

- 74a. var. *ellipticum* Lewin Pl.40, f.18.

- Krieger 1932, 205, Pl.15, f.10 (forma).
L. 31 μm , B. 33 μm , and I. 8.6 μm . St. 18. Indonesia (Java, Sumatra, Bali).
- 74b. var. *subproductum* W. & G.S.West Pl.39, f.4.
West 1911, 4, 182, Pl.127, f.15; Hirano 1959, Contr. 9, 300, Pl.38, f.17; Prescott et al. 1982, 2:4, 294, Pl.339, f.8.
L. 20–29 μm , B. 22–28 μm , and I. 4.5–10 μm . Sts. 30,32. Europe, N.America. New to Thailand.
75. *St. pygmaeum* Bréb. var. *obtusum* Wille Pl.47, f.21, 25
Krieger 1932, 205, Pl.15, f.11.
L. 17.6–25 μm , B. 20–25 μm , and I. 5.7–6 μm . Sts. 22,25,32. Indonesia (Sumatra). New to Thailand.
76. *St. retusum* Turner var. *retusum* Pl.36, f.10.
Krieger 1932, 206, Pl.15, f.6; Prescott et al. 1982, 2:4, 300, Pl.335, f.7.
L. 25 μm , B. 26.4 μm , and I. 8 μm . Sts. 19,51. Philippines, Europe, Africa, Australia. New to Thailand. Indonesia (Sumatra)
- 76a. var. *boreale* W. & G.S.West Pl.38, f.9; Pl.39, f.1; Pl.47, f.15,16.
West 1911, 4, 160, Pl.125, f.8.
L. 16.7–26.4 μm , B. 17.6–26 μm , and I. 4.4–6 μm . Sts. 19,43,51. Europe. New to Thailand.
77. *St. saltans* Joshua var. *polycerax* Scott & Prescott Pl.48, f.9.
Scott & Prescott 1961, 105, Pl.51, f.7.
L. 40.5 μm , Bssp. 61.6 μm , Bcpr. 83.6 μm , and I. 10 μm . St. 53. Indonesia (Java). New to Thailand.
- 77a. var. *sumatranum* Scott & Prescott Pl.41, f.1.
Scott & Prescott 1961, 106, Pl.51, f.3,4.
Lssp. 42–44 μm , Bcsp. 88–96.8 μm , and I. 9 μm . St. 19. Indonesia (Sumatra). New to Thailand.
78. *St. sebaldi* Reinsch var. *ornatum* Nordst. Pl.46, f.4,5.
Scott & Prescott 1961, 106, Pl.44, f.4.
L. 44–61.6 μm , Bcpr. 88–92.4 μm , and I. 9–13 μm . Sts. 7,18. Indonesia (Sumatra). New to Thailand.
- 78a. var. *ventrivrucosum* Scott & Prescott Pl.41, f.11.
Scott & Prescott 1961, 106, Pl.44, f.5.
L. 39.6 μm , B. 66–70.4 μm , and I. 11–12.3 μm . Sts. 13,21,24. Indonesia (Java). New to Thailand.
79. *St. senarium* (Ehrenb.) Ralfs Pl.40, f.20.
West & Carter 1923, 5, 175, Pl.156, f.3; Krieger 1932, 206, Pl.16, f.14; Prescott et al. 2:4, 308, Pl.375, f.9–11.

Lspr. 26–31 μm , Lcpr. 37.4 μm , Bspr. 26.4–31 μm , and I. 11–12 μm . Sts. 36,39. Indonesia (Sumatra). New to Thailand.

80. *St. setigerum* Cleve Pl.48, f.13,14
 West & Carter 1923, 5, 52, Pl.136, f.13,14; Scott & Prescott 1961, 107, Pl.56, f.2; Prescott et al. 1982, 2:4, 309, Pl.359, f.8,9; Pl.360, f.5.
 Lssp. 37.4 μm , Bbsp. 35 μm , and I. 11 μm . Cells moderate in size, a little longer than the breadth, deeply constricted, sinus widely open; semicells elliptic, covered with two kinds of spines, one long and stout spines at the apical angle, and the other slender and delicate spines at the surface of a semicell. The specimens examined from Thailand are smaller in size than those of the European form. St. 26. Indonesia (Java), Europe, N. & S.America, Africa. New to Thailand.
81. *St. sexangulare* Lund. var. *asperum* Playfair Pl.46, f.6,7.
 Krieger 1932, 206, Pl.17, f.2; Scott & Prescott 1961, 107, Pl.45, f.1–3.
 Lcpr. 101–105 μm , Bcpr. 110–119 μm , and I. 17.6–20 μm . Sts. 10,23. Indonesia (Java). New to Malaysia and Thailand.
- 81a. var. *attenuatum* Turner
 Turner 1892, 117, Pl.15, f.3; Scott & Prescott 1961, 107, Pl.46, f.5.
 Lcpr. 50 μm , Bcpr. 68–72 μm , and I. 10 μm . St. 21. India, Indonesia (Java, Sumatra). New to Thailand.
- 81b. var. *bidentatum* Gutw. Pl.45, f.2,8; Pl.47, f.3.
 Krieger 1932, 207, Pl.45, f.4,5; Scott & Prescott 1961, 107, Pl.45, f.4,5.
 Lcpr. 105.6 μm , Bcpr. 110 μm , and I. 22 μm . Sts. 21,32. Indonesia (Bórneo, Java). New to Thailand.
- 81c. var. *productum* Nordst. Pl.43, f.4; Pl.45, f.1.
 Scott & Prescott 1961, 107, Pl.46, f.3,4.
 Lspr. 33–44 μm , Lcpr. 70.4–88 μm , Bspr. 42 μm , Bcpr. 83–88 μm , and I. 12–13 μm . Sts. 19,32,36,49. Indonesia (Sumatra). New to Thailand.
- 81d. var. *subglabrum* W. & G.S.West Pl.43,f.3,11.
 Scott & Prescott 1961, 107, Pl.46, f.1,2.
 Lspr. 34–36 μm , Lcpr. 66–79 μm , Bcpr. 66–75 μm , and I. 15–17 μm . Sts. 19,23,36,43,44,53. Indonesia (Sumatra). New to Thailand.
82. *St. sonthalianum* Turner Pl.41, f.6.
 Turner 1892, 124, Pl.14, f.27; Krieger 1932, 207, Pl.19, f.11; Prescott et al. 1982, 2:4, 314, Pl.442, f.1.
 L. 39 μm , Bcpr. 66 μm , and I. 11 μm . St. 26. Japan, Indonesia (Java, Sumatra), U.S.A., New Zealand. New to Thailand.
83. *St. smithii* (G.S.West) Teil. Pl.48, f.7,8.
 Scott & Prescott 1961, 108, Pl.52, f.5,6.
 L. 13 μm , Bcpr. 77 μm , and I. 5.7 μm . St. 19. Indonesia (Java, Bali). New to Thai-

land.

84. *St. striolatum* (Näg.) Arch. var. *divergens* W. & G.S. West Pl.49, f.2.
 Krieger 1932, 207, Pl.15, f.8.
 L. 17.6–19.8 μm , B. 19–20 μm , and I. 6.5–7 μm . Sts. 10,20. Ceylon, Indonesia (Java). New to Thailand.

85. *St. subarmigerum* Roy & Bisset
 Roy & Bisset 1886, Journ. Bot. 24, 239, Pl.268, f.2.
 Lspr. 22 μm , Lcpr. 30.8 μm , Bcpr. 26.4 μm , and I. 6.5 μm . Sts. 19,31. Japan. New to Thailand.

86. *St. subcornutum* DeToni Pl.39, f.7.
 Prescott et al. 1982, 2:4, 320, Pl.348, f.13.
 L. 81.4 μm , B. 70.4 μm , and I. 16.3 μm . Cells large, 1.2 times longer than the breadth without spines, deeply constricted at the middle, sinus open acutely; semicells transversely rhomboid-elliptic, apex strongly convex, lateral angles acute and with a long, stout, incurved spine, spines directed downward, ventral margin slightly convex; semicells in vertical view triangular, side view slightly concave, angles rounded, with a long spine. The specimens examined from Malaya are somewhat larger than the form described by Prescott et al. St. 9. N. & S. America. New to Thailand.

87. *St. subgracilimum* W. & G.S. West Pl.40, f.8.
 West 1896, Trans. Linn. Soc. Bot. II, 5:5, 263, Pl.17, f.3,4; Prescott et al. 1982, 2:4, 323, Pl.404, f.12.
 L. 16.7–19.8 μm , Bcpr. 28.6–35 μm , and I. 6–6.5 μm . Sts. 36,40. Europe, Australia, New Zealand. New to Thailand.

88. *St. sublaevispinum* W. West Pl.37, f.7.
 West 1898, Journ. Linn. Soc. Bot. 33, 314, Pl.18, f.20–22; Prescott et al. 1982, 2:4, 323, Pl.386, f.11, Scott & Prescott 1961, 110, Pl.53, f.5.
 L. 26–28 μm , B. 38–40 μm , and I. 7–8 μm . St. 41. Indonesia (Sumatra), U.S.A. New to Thailand.

89. *St. submanfeldtii* W. & G.S. West Pl.46, f.8,9.
 West 1902, 188, Pl.22, f.16.
 L. 36 μm , Bcpr. 57 μm , and I. 8.5 μm . Cells of medium size, approximately 1.6 times broader than the length including processes, moderately constricted, sinus open; semicells cyathiform, apical angles produced into a long, horizontal process, apex slightly convex, verrucose from the centre to the basal part of a process with 2 or 3 verrucae disposed, part of a process with a simple and sharp spine, ventral side of the basal part of a process with a emarginate verruca; vertical view of a semicell triangular, side concave, with an intramarginal series of verrucae in the central part of a semicell, and a series of simple granules at the process. St. 10. N. & S. America, Africa. New to Thailand.

- 89a. var. *elegans* W. & G.S.West Pl.44, f.10.
Krieger 1932, 208, Pl.19, f.8.
L. 28.6 μm , Bcpr. 35 μm , I. 8.6 μm . St. 43. Indonesia (Java). New to Thailand.
90. *St. subpygmaeum* West var. *subangulatum* W. & G.S.West Pl.47, f.8.
West 1911, 4, 163, Pl.124, f.1; Prescott et al. 1982, 2:4, 327, Pl.364, f.2.
L. 39.6 μm , B. 37.4 μm , I. 6.5 μm . Cells of medium size, a little longer than the breadth, deeply constricted, sinus widely open; semicells transversely rhomboid-elliptic, lateral angles rounded; vertical view of a semicell triangular, sides nearly straight. St. 23. Europe, U.S.A. New to Thailand.
91. *St. subsaltans* W. & G.S.West var. *subsaltans* Pl.51, f.19.
W. & G.S.West 1902, Trans. Linn. Soc. Bot. 6, 187, Pl.22, f.15.
L. 29.5 μm , Bcpr. 66 μm , I. 6.5 μm . St. 48. Ceylon. New to Thailand.
- 91a. var. *indonesianum* Scott & Prescott Pl.49, f.18.
Scott & Prescott 1961, Hydrobiol. 17, 110, Pl.52, f.1.
L. 32–37.4 μm , Bspr. 15.4 μm , Bcpr. 57–79 μm , I. 6.5–8 m. Sts. 18,19,31. Indonesia (Sumatra). New to Thailand.
92. *St. subscolopacinum* W. & G.S.West
W. & G.S.West 1896, Trans. Linn. Soc. Bot. 5, 256, Pl.16, f.11.
L. 24–25 μm , Bssp. 22–26.4 μm , I. 4–5 μm . Sts. 24,31,32. U.S.A. New to Thailand.
93. *St. tauphorum* W. & G.S.West Pl.48, f.4,5.
West 1902, 191, Pl.22, f.23–25; Skuja 1949, 161, Pl.35, f.18,19.
Lspr. 39.6 μm , Lcpr. 64.8 μm , Bcpr. 96.8 μm , and I. 8 μm . St. 19. Ceylon, Burma. New to Thailand.
94. *St. tenuissimum* W. & G.S.West Pl.49, f.14,15
West 1895, 78, Pl.8, f.43; Hirano 1959, Contr. 9, 372, Pl.49, f.15, 16.
L. 22 μm , Bcpr. 31 μm , I. 6 μm . St. 25. Ceylon, Japan, Madagascar. New to Thailand.
95. *St. tetracerum* Ralfs
West & Carter 1923, 5, 118, Pl.149, f.2,3; Krieger 1932, 112, Pl.57, f.12; Skuja 1949, 161, Pl.34, f.6.
Lcpr. 20–26.4 μm , Bcpr. 20–26.5 μm , and I. 4.4–5.3 μm . Sts. 25,32,35,36,39,40,44. Cosmopolitan. New to Thailand.
96. *St. thienemanii* Krieger var. *calvum* Scott & Prescott Pl.40, f.5.
Scott & Prescott 1961, 113, Pl.42, f.6.
Lspr. 22–23.3 μm , Lcpr. 50.6–53 μm , Bspr. 17.6–19 μm , Bcpr. 86–88 μm , and I. 12–13 μm . Sts. 35,39,40,41. Indonesia (Sumatra). New to Thailand.
- 96a. f. *triradiatum* Scott & Prescott Pl.41, f.7.

- Scott & Prescott 1961, 113, Pl.42, f.5.
Lspr. 16 μm , Lcpr. 26 μm , Bcpr. 30 μm , and I. 9 μm . St. 39. Indonesia (Sumatra).
New to Thailand.
97. *St. tohopekaligense* Wolle f. *tohopekaligense*
West & Carter 1923, 5, 178, Pl.155, f.12; Hirano 1959, 378, Pl.51, f.1,2.
Lcpr. 88 μm , Bcpr. 96.8 μm , and I. 19.8 μm . St. 24. India, Ceylon, Japan, Europe,
U.S.A., Africa. New to Thailand.
- 97a. f. *minus* (Turner) Scott & prescott
Scott & Prescott 1961, 114, Pl.48, f.4–6.
Lspr. 22 μm , Lcpr. 35 μm , Bcpr. 31 μm , Bcpr. 31 μm . St. 49. Indonesia (Java,
Sumatra). New to Thailand.
- 97b. var. *insigne* W. & G.S.West Pl.42, f.7,8.
West 1902, 181, Pl.21, f.28; Scott & Prescott 1961, 113, Pl.47, f.12–15.
Lspr. 35 μm , Lcpr. 62 μm , Bspr. 24 μm , Bcpr. 70.4 μm , and I. 14.5 μm . Sts. 18,19.
Ceylon, Indonesia (Borneo).
98. *St. tripyrenoideum* Scott & Prescott Pl.47, f.7.
Scott & Prescott 1961, 114, Pl.49, f.6.
L. 36.5–57 μm , B. 40.5–53 μm , and I. 8–16 μm . Sts. 22,51. Indonesia (Sumatra).
New to Thailand.
99. *St. trissacanthum* Scott & Prescott 1961, 115, Pl.54, f.7.
L. 39.6 μm , B. 37.4 μm , I. 13 μm . St. 20. Indonesia (Sumatra). New to Thailand.
100. *St. unguiferum* Turner var. *inerme* (Turner) W. & G.S.West
West 1907, Ann. Roy. Bot. Gard. Calcutta 6, 213, Pl.16, f.11; Hirano 1972, Contr.
23, 155, Pl.11, f.4.
L. 45 μm , B. 35 μm , and I. 11 μm . Cells slightly longer than the breadth, deeply
constricted at the middle, sinus widely open but somewhat acuminate at the extremity;
semicells obverse-triangular, lateral margins slightly retuse, apical angles rounded and
slightly produced obliquely upward, apex slightly concave. St. 31. India, Burma, Cam-
bodia. New to Thailand.
101. *St. unicorn* Turner Pl.39, f.5.
Turner 1892, 107, Pl.15, f.16.
L. 26.4 μm , B. 30 μm , and I. 7.5 μm . Cells of a little less than a medium size,
approximately as long as the breadth, deeply constricted at the middle, sinus widely
open, broadly rounded at the extremity; semicells obtriangular, apex slightly convex,
apical angles capitate with a long, elected and incurved spine, ventral margin slightly
convex. St. 43. India, China. New to Thailand.
102. *St. wildemanii* Gutw. var. *wildemanii* Pl.38, f.10
Scott & Prescott 1961, 119, Pl.49, f.1.
L. 61.6 μm , B. 61.6 μm , I. 22–26 μm . Sts. 10,21,23,24,25,36,53. Indonesia (Borneo,

Java, Sumatra). New to Malaysia and Thailand.

- 102a. var. *majus* (W. & G.S.West) Scott & Prescott Pl.39, f.6.
 Scott & Prescott 1961, 119, Pl.49, f.2.
 Lspr. 48.4–66 μm , Lcpr. 88–92 μm , Bspr. 44–70 μm , Bcpr. 88–92 μm , I. 20–26 μm . Sts. 22,24,25,53. Indonesia (Sumatra). New to Thailand.
103. *St. xanthium* Krieger Pl.41, f.5; Pl.48, f.3.
 Krieger 1932, 209, Pl.18, f.8; Scott & Prescott 1961, 119, Pl.58, f. 10.
 Lssp. 24–26 μm , Lcsp. 44–48 μm , Bssp. 33–40 μm , Bcsp. 40–66 μm , I. 11 μm .
 Sts. 6,25. Indonesia (Java, Suamtra, Borneo). New to Thailand.
104. *St. zahlbruckneri* Lütkenmüller var. *zahlbruckneri* Pl.39, f.8.
 Lütkenmüller 1900, Ann. K.K. Nat. Hist. Hofm. 15, 125, Pl.6, f.41–43; Hirano 1959,
 Contr. 7, 292, Pl.38, f.23.
 L. 110 μm , B. 88 μm , I. 35 μm . St. 44. China, Japan. New to Thailand.
- 104a. var. *manillatum* W.& G.S.West Pl.37,f.3; Pl.49, f.6.
 West 1901, 94, Pl.3, f.35–37; Scott & Prescott 1961, 119, Pl.44, f.8.
 L. 110 μm , B. 84 μm , I. 31 μm . St. 22. Indonesia (Java, Sumatra).
105. *St. zonatum* Börges. var. *ceylanicum* W. & G.S.West Pl.43, f.12,13
 Krieger 1932, 210, Pl.16, f.11; Scott & Prescott 1961, 119, Pl.59, f.2.
 L. 26.4–27 μm , Lcpr. 35–44 μm , Bcpr. 35–44 μm , I. 8–9 μm . Sts. 7,36,40,41. In-
 donesia (Sumatra). New to Thailand.
- 105a. var. *majus* Scott & Prescott Pl.42, f.1,2.
 Scott & Prescott 1961, 119, Pl.46, f.8, Pl.48, f.7,8.
 Lspr. 35–44 μm , Lcpr. 40–75 μm , Bspr. 44–57 μm , Bcpr. 53–72 μm , I. 10–15 μm .
 Sts. 22,51,53. Indonesia (Borneo, Sumatra). New to Thailand.
1. *Hyalotheca dissiliens* (Sm.) Bréb. var. *dissiliens* Pl.50, f.9.
 West & Carter, 1923, 5, 229, Pl.161, f.16–27; Prescott et al. 1975, 2:5, 28, Pl.460,
 f.6–12.
 L. 15.4–20 μm , B. 16.7–30 μm . Sts. 22,29. Cosmopolitan.
- 1a. var. *hians* Wille Pl.50, f.8.
 West & Carter 1923, 5,234, Pl.162, f.16–18; Krieger 1932, 221, Pl.26, f.12; Scott &
 Prescott 1961, 122, Pl.61, f.2; Prescott et al. 1983, 2:5, 29, Pl.461, f.2,3.
 L. 12.3–13.2 μm , B. 15–16.7 μm , Sts. 19,26,29,47. Ceylon, Indonesia (Java, Suma-
 tra), Japan, Europe, U.S.A., New Zealand.
- 1b. var. *tatrica* Racib. Pl.50, f.15.
 West & Carter 1923, 5,234, Pl.162, f.19; Prescott et al. 1983, 2:5, 29, Pl.461, f.4.
 L. 15.4–19.8 μm , B. 13.2–17.6 μm , Sts. 19,36,38,39. Japan, Europe, N. & S.Amer-
 ica, Africa.
2. *H.mucosa* (Mert) Ehrenb.

- West & Carter 5, 1923, 235, Pl.162, f.1–4; Prescott et al. 1983, 2:5, 30, Pl.461, f.6–8.
- L. 15.4 μm , B. 11 μm . St. 19. India, Burma, Indonesia (Java), Japan, Europe, N. & S.America, Africa, Australia. New to Thailand.
3. *H. undulata* Nordst. var. *perundulata* Grönblad Pl.51, f.9.
Scott & Prescott 1961, Hydrobiol. 17, 122, Pl.61, f.4
L. 18.5 μm , B. 7.5 μm . St. 23. Indonesia (Sumatra). New to Thailand.
 1. *Haplozyga armata* (Lofgr. & Nordst.) Racib. var. *raciborskii* Förster Pl.50, f.10.
Förster 7 Eckert 1966, Rev. Alg. 8, 154, Pl.1, f.1.
L. 39.6–42 μm , B. 31–40.5 μm , and I. 13–14 μm . Cells of medium size, 1.3 times broader than the length, moderately constricted at the middle, sinus open rectangularly; semicells subhexagonal, lateral part produced somewhat like a conical process, the extremity with a stout, short spine, upper part of a semicell short and cylindrical (slightly dilated upward), apex truncate, straight, and connected directly to an adjacent cell; semicell in vertical view with 8 radial, inflated processes, each of which has a short spine. Sts. 9,36,39,40,41. Brazil. New to Thailand.
 1. *Spondylosium javanicum* (Gutw.) Grönblad var. *javanicum* Pl.50, f.13.
Scott & Prescott 1961, 121, Pl.60, f.10; Prescott et al. 1983, 2:5, 19, Pl.457, f.14,15.
L. 26.4 μm , B. 28.6–31 μm , and I. 6–6.5 μm . Sts. 20,23,24, Indonesia Borneo, Sumatra), Brazil. New to Thailand.
 2. *Sp. nitens* (Wall.) Arch. var. *triangulare* Turner Pl.50, f.12.
Turner 1892, 25:5, 44, Pl.18, f.17a,c; Krieger 1932, 220, Pl.26, f.1; Prescott et al. 1983, 2:5 21, Pl.458, f.4,5.
L. 31.7 μm , B. 26.4 μm , and I. 6.5 μm . St. 9. India, Burma, Indonesia (Borneo, Sumatra), Celebes, Canada. New to Thailand.
 3. *Sp. planum* (Wolle) W. & G.S.West var. *planum* Pl.50, f.14,16
West & Carter 1923, 5, 222, Pl.160, f.23–25; Prescott et al. 1983, 2:5, 21, Pl.456, f.6,7.
L. 13.2–16.7 μm , B. 16.3–19.8 μm , and I. 6.5–8 μm . Cells of medium size, slightly broader than the length, deeply constricted, sinus open and linear, extremity obtuse; semicells transversely oblong, apex truncate and flattened, the connecting part of a semicell slightly elevated; side view of a semicell circular. Sts. 18,19,23,25. Europe, U.S.A. New to Thailand.
 1. *Groenbladia neglecta* (Racib.) Teiling var. *neglecta* Pl.51, f.2,3.
Scott & Prescott 1961, 122, Pl.61, f.7; Prescott et al. 1983, 2:5, 33, Pl.462, f.1–5.
L. 27.7–30.8 μm , B. 10–11 μm , and I. 10.6 μm . Sts. 19,39. Indonesia (Sumatra), Europe, Africa, Australia, New Zealand. New to Thailand.
 - 1a. var. *elongata* Scott & Prescott Pl.51, f.1.
Scott & Prescott 1961, 123, Pl.61, f.8; Prescott et al. 1983, 2:5, 33, Pl.462, f.6–13,

Pl.463, f.1–3.

L. 46–48.4 μm , B. 9–10 μm , and I. 9.7–10 μm . Sts. 35,36,39,40. Indonesia (Borneo), U.S.A., S.America, Africa. New to Thailand.

1. *Onychonema filiformis* (Ehrenb.) Roy & Bisset

Roy & Bisset 1886, Jour. Bot. 24, 242; West & Carter 1923, 5, 216, Pl.160, f.13,14; Prescott et al. 1983, 2:5, 13, Pl.452, f.1–5.

L. 15.4 μm , B. 19.8 μm . St. 32. India, Cambodia, Celebes, Japan, Europe, U.S.A., Australia, New Zealand.

2. *O. laeve* Nordst.

Pl.50, f.4.

West & Carter 1923, 5,218, Pl.160, f.15,16; Krieger 1932, 220, Pl.26, f.3; Skuja 1949, 161, Pl.35, f.11.

L. 15.4 μm , B. 19 μm , and I. 5.3 μm . St. 30. India, Ceylon, Burma, Indonesia (Java, Sumatra), Cambodia, Japan, Europe, Brazil. New to Thailand.

2a. *var. hexagonum var. nov.*

Pl.51, f.1.

Semicellulae late hexagonae, cum apice undulato, long. 13–24 μm , lat. 17.5–26.5 μm , lat. isth. 5.4–6.5 μm . St. 19,23.

Type: Pl.51, f.1. Loc. Phuket Island, Thailand.

Semicells transversely hexagonal, apex truncate and undulate, isthmus of semicell deeply and narrowly linear, lateral spine short and teeth-like but in some specimens show long and robust (Pl.50, fig.1.) Long of cell 13–24 μm , width 17.5–26.5 μm , isthmus of cell 5.4–6.5 μm .

1. *Teilingia excavata* (Ralfs) Bourrelly

Pl.51, f.10.

Bourrelly 1964, Rev. Alg. 7, 190, f.10. *Syn. Sph. excavata* Ralfs

L. 15.4 μm , B. 13.2 μm , and I. 6.2 μm . St. 20. India, Europe, N.America, Africa, Australia. New to Thailand.

2. *T. granulata* (Roy & Bisset) Bourrelly

Bourrelly 1964, Rev. Alg. 7, 190, f.9; Prescott et al. 1983, 2:5, 9, Pl.451, f.3–5. *Syn. Sph. granulata* Roy & Bisset 1886, 242, Pl.268, f.17.

L. 11 μm , B. 12.3 μm , and I. 4.4 μm . Sts. 19,37,51. Indonesia (Sumatra), Cambodia, Japan, Europe, U.S.A., Australia, New Zealand. New to Thailand.

1. *Desmidium aptogonum* Bréb. *var. aptogonum*

West & Carter 1923, 5, 242, Pl.164, f.1–3; Prescott et al. 1983, 2:5, 39, Pl.463, f.7,8.

L. 17.6 μm , B. 26.4 μm , and I. 16 μm . St. 12. India, Ceylon, Burma, Indonesia (Java), N. & S.America, Madagascar, Australia. New to Thailand.

1a. *var. tetragonum* W. & G.S.West

Pl.50, f.7.

Scott & Prescott 1961, 124, Pl.62, f.5–7.

L. 18.5 μm , B. 33.4 μm , and I. 22 μm . St. 51. Indonesia (Borneo, Java, Sumatra). New to Thailand.

2. *D. baileyi* (Ralfs) Nordst.

- Skuja 1949, 162, Pl.35, f.13; Hirano 1972, Contr. 23, 157; Prescott et al. 1983, 2:5, 41, Pl.464, f.8,9.
 L. 20–21 μm , B. 22–24 μm , and I. 22.5 μm . Sts. 22,32, Burma, Japan, Europe, Africa, Australia, New Zealand.
3. *D. coarctatum* Nordst. Pl.51, f.13.
 West & Carter 1923, 5, 252, Pl.165, f.1,2; Krieger 1932, 220, Pl.26, f.7; Prescott et al. 1983, 2:5, 42, Pl.465, f.2–4.
 L. 20–33 μm , B. 24–30 μm , and I. 21 μm . Sts. 21,22,36,37,38,40,41. Indonesia (Sumatra), Europe. Cosmopolitan. New to Thailand.
4. *D. graciliceps* (Nordst.) Lagerh. Pl.51, f.6,7.
 West & Carter 1923, 5, 253, Pl.166, f.5; Scott & Prescott 1961, 123, Pl.63, f.1–4; Prescott et al. 1983, 2:5, 44, Pl.466, f.1–5.
 L. 48.4 μm , B. 39.6 μm , and I. 24.2 μm . Sts. 1,39,41. India, Ceylon, Indonesia (Sumatra), Europe, Brazil, New Zealand. New to Thailand.
5. *D. pseudostreptonema* W. & G.S.West Pl.51, f.11
 West & Carter 1923, 5, 244, Pl.165, f.5,6; Prescott et al. 1983, 2:5, 47, Pl.466, f.12–16.
 L. 16.7 μm , B. 28.6 μm , and I. 20.7 μm . St. 10. Ceylon, Europe, Australia. New to Malaysia.
6. *D. quadratum* Nordst. Pl.50, f.3: Pl.51, f.8.
 West & Carter 1923, 5,254, Pl.166, f.6,7; Scott & Prescott 1961, 125, Pl.63, f.5,6; Prescott et al. 1983, 2:5, 47, Pl.467, f.2,3.
 L. 16.7–28.6 μm , B. 22–53 μm , and I. 32.7–37.4 μm . Cells of medium size, approximately 1.3 times broader than the length, constriction slight, sinus open and re-tuse; semicells lowly pyramidal, lateral margins convex biundulate, apex straight and directly connected with an adjacent semicell. Sts. 22,30. Ceylon, Indonesia (Borneo, Sumatra), Europe, U.S.A., Brazil. New to Thailand.
7. *D. suboccidentale* Scott & Prescott Pl.50, f.2.
 Scott & Prescott 1961, 125, Pl.63, f.7.
 L. 17.6 μm , B. 33 μm . St. 32. Indonesia (Borneo, Sumatra, Java). New to Thailand.
8. *D. swartzii* Ag. Pl.51, f.12.
 West & Carter 1923, 5, 246, Pl.163, f.5–8; Krieger 1932, 221, Pl.26, f.8; Scott & Prescott 1961, 125, Pl.63, f.8; Hirano 1972, Contr. 23, 157.
 L. 15 μm , B. 40 μm , and I. 34 μm . Sts. 20,32. India, Burma, Indonesia (Sumatra), Cambodia, Japan, Europe, N.America, Australia, New Zealand.
1. *Bambusina brebissonii* Kütz. var. *brebissonii*
 Prescott et al. 1983, 2:5, 55, Pl.470, f.1–11. Syn. *Gymnozyga moniliformis* Ehrenb.
 L. 26.4–28 μm , B. 17.6–20 μm , and I. 17.6 μm . Sts. 21,28,30,41,53. Cambodia, Indonesia (Sumatra), Japan. Cosmopolitan.

1a. var. *gracilescens* Nordst.

Pl.51, f.5.

Scott & Prescott 1961, 123, Pl.62, f.4.

L. 35 μm , B. 16.3 μm . Sts. 40,41. Ceylon, Indonesia (Java), Europe, U.S.A., Brazil.
New to Thailand.

EXPLANATION OF FIGURES

Plate 1

1. *Gonatozygon aculeatum* Hast. 2. *G. monotaenium* Debary 3,4. *G. kinahani* (Arch.) Rabenh. 5. *Closterium parvulum* Näg. 6. *Cl. parvulum* Näg. var. *angustum* W. & G.S. West 7. *Cl. flaccidum* Delp. 8. *Mesotaenium macrococcum* (Kütz.) Roy & Bisset 9. *Cl. ehrenbergii* Menegh. var. *malinvernianum* (DeNot.) Rabenh. 10. *Cl. moniliferum* (Bory) Ehrenb. var. *concovum* Klebs 11. *Cl. intermedium* Ralfs 12. *Cl. acutum* Bréb. 13. *Cl. gracile* Bréb. 14. *Tetmemorus laevis* (Kütz.) Ralfs var. *tropicus* Krieger 15. *Cl. infractum* Messik.

Plate 2

1. *Closterium ralfsii* Bréb. var. *hybridum* Rabenh. 2. *Cl. venus* Kütz. 3. *Cl. acerosum* (Schränk) Ehrenb. var. *elongatum* Bréb. 4. *Cl. kuetzingii* Bréb. 5. *Cl. idiosporum* W. & G.S. West 6. *Cl. ehrenbergii* Menegh. 7. *Cl. diana* Ehrenb. 8. *Cl. archerianum* Cleve

Plate 3

1. *Actinotaenium westii* (Bernard) Hirano, com. nov. 2. *Cl. baillyanum* (Bréb.) Bréb. 3. *Cl. striolatum* Ehrenb. var. *subdirectum* (W. West) Krieger 4. *Cl. calosporum* Wittr. 5. *Cl. striolatum* Ehrenb. var. *borgei* (Borge) Krieger 6. *Cl. striolatum* Ehrenb. 7. *Cl. laterale* Nordst. 8. *Cl. ulna* Focke 9. *Cl. striolatum* Ehrenb. var. *borgei* (Borge) Krieger 10. *Cl. parvulum* Näg. var. *angustum* W. & G.S. West 11. *Cl. pusillum* Hantzsch var. *majus* Racib. 12. *Cl. striolatum* Ehrenb. var. *rectum* W. West 13. *Cl. cornu* Ehrenb.

Plate 4

1. *Closterium ulna* Focke 2. *Cl. subscoticum* Gutw. 3. *Cl. ulna* Focke 4. *Cl. ralfsii* Bréb. var. *hybridum* Rabenh. 5. *Cl. pseudopussillum* Messik. 6. *Mesotaenium degreyi* Turner 7. *M. endolichianum* Näg. 8. *Cl. pussillum* Hantz. var. *majus* Racib. 9. *Cl. ulna* Focke 10. *Cl. rostratum* Ehrenb. 11. *Cl. intermedium* Ralfs 12. *Penium spirostriolatum* Barker 13,14. *Tetmemorus granulatus* (Bréb.) Ralfs var. *attenuatum* W. West 15. *Cylindrocystis brebissonii* Menegh.

Plate 5

1. *Tetmemorus laevis* (Kütz.) Ralfs var. *minutus* (DeBary) Krieger 2-4. *Ichthyocercus longispinus* (Borge) Krieger 5. *Cylindrocystis brebissonii* Menegh. var. *jenneri* (Ralfs) Hansg. 6. *Docidium baculum* Bréb. 7. *Penium margaritaceum* (Ehrenb.) Bréb. 8. *Pleurotaenium trabecula* (Ehrenb.) Näg. 9. *Pl. trabecula* (Ehrenb.) Näg. var. *crassum* Wittr. 10,11. *Pl. rectum* Delp. 12,13. *Pl. baculoides* (Roy & Bisset) Playfair 14. *Pl. indicum* (Grun.) Lund.

Plate 6

1. *Closterium moniliferum* (Bory) Ehrenb. var. *concovum* Klebs 2. *Cl. pseudolunula* Borge 3. *Cl. pritchardianum* Arch. 4. *Cl. acerosum* (Schränk) Ehrenb. var. *acerosum* 5. *Cl. acerosum* (Schränk.) Ehrenb. var. *elongatum* Bréb. 6. *Cl. pusillum* Hantzsch var. *majus* Racib. 7. *Cl. pseudolunula* Borge 8. *Cl. ehrenbergii* Menegh. var. *malinvernianum* (DeNot.) Rabenh.

Plate 7

1. *Closterium acerosum* (Schränk) Ehrenb. var. *casinoense* Playfair 2. *Cl. juncidum* Ralfs var. *elongatum* Roy & Bisset 3. *Cl. cornu* Ehrenb. 4,5. *Cl. nematodes* Joshua 6. *Cl. leibleinii* Kütz. 7. *Cl. acutum* Bréb. var. *variabile* (Lemm.) Krieger 8. *Cl. diana* Ehrenb. var. *arcuatum* (Bréb.) Rabenh. 9. *Cl. ralfsii* Bréb. var. *gracilius* (Maskell) Krieger 10. *Cl. pusillum* Hantz. var. *majus* Racib. 11. *Pl. minutum* (Ralfs) Delp. var. *minutum* 12. *Pl. minutum* (Ralfs) Delp. var. *crassum* (W. West) Krieger 13. *Pl. minutum* (Ralfs) Delp. var. *cylindricum* (Borge) Krieger

Plate 8

1. *Pleurotaenium cylindricum* (Turner) Schmidle var. *stuhlmannii* (Hieron.) Krieger 2. *Pl. subcoronulatum* (Turner) W. West 3. *Pl. maximum* (Reinsch) Lund. 4. *Pl. nodulosum* (Bréb.) Debary 5. *Pl. cuyabense* Borge var. *inornatum* (W. & G.S. West) Bando 6. *Pl. coroniferum* (Borge) Krieger 7. *Pl. excelsum* (Turner) Gutw. 8. *Ichthyocercus angolensis* W. & G.S. West 9. *Actinotaenium cucurbita* (Bréb.) Teil. 10. *Act. crassiusculum* (DeBary) Teil.

Plate 9

1. *Pleurotaenium elatum* (Turner) Borge 2. *Pl. trabecula* (Ehrenb.) Näg. var. *thailandicum* Hirano 3. *Pl. granuliferum* (Joshua) Hirano 4. *Pl. annuloides* Hirano 5. *Pl. minutum* (Ralfs) Delp. var. *latum* Kaiser 6. *Pl. minutum* (Ralfs) Delp. var. *gracile* (Wille) Krieger 7. *Closterium gracile* Bréb. var. *elongatum* W. & G.S. West 8. *Actinotaenium westii* (Bernard) Hirano 9. *Act. subglobosum* (Nordst.) Teil. 10. *Cosmarium thwaitesii* Ralfs 11. *C. exiguum* Arch. F. *ocellatum* Grönblad et Croas. 12. *C. regnellii* Wille

Plate 10

1,2. *Pleurotaenium ehrenbergii* (Bréb.) DeBary var. *ehrenbergii* 3,4. *Pl. ehrenbergii* (Bréb.) DeBary var. *undulatum* Schaarschm. 4,5. *Pl. ehrenbergii* var. *undulatum* f. *distincta* Hirano, f. nov. 6. *Closterium lanceolatum* Kütz. 7. *Pl. minutum* (Ralfs) Delp. var. *atenuatum* Krieger 8. *Actinotaenium cucurbitinum* (Bisset) Teil. 9. *Pleurotaenium nodosum* (Bail.) Lund. var. *gutwinski* Krieger 10. *Triploceras gracile* Bailey

Plate 11

1. *Pleurotaenium verrucosum* (Bail.) Lund. var. *coronatum* Krieger 2. *Pl. verrucosum* (Bail.) Lund. var. *bulbosum* Krieger 3. *Pl. trochiscum* W. & G.S. West 4. *Pl. ovatum* Nordst. var. *tumidum* (Maskell) G.S. West 5,6. *Pl. ovatum* Nordst. var. *tumidum* (Maskell) G.S. West 7. *Closterium lineatum* Ehrenb. 8. *Actinotaenium curtum* (Bréb.) Teil.

Plate 12

1,3. *Actinotaenium adelochondrum* (Elfv.) Teil. var. *kriegeri* (Messik.) Ruzicka 2. *Act. clevei* (Lund.) Teil. 4. *Act. inconspicuum* (W. & G.S. West) Teil. 5. *Act. obcuneatum* (West) Teil. 6. *Act. cucurbita* (Bréb.) Teil. 7,8. *Act. cucurbitinum* (Bisset) Teil. 9. *Act. truncatum* (Bréb.) Teil. 10. *Act. capax* (Joshua) Teil. var. *minus* (Schm.) Teil. 11. *Act. australe* (Racib.) Croasdale 12. *Act. diplosporum* (Lund.) Teil. f. *majus* (West) Teil. 13. *Act. australe* (Racib.) Croasdale 14. *Act. capax* (Joshua) Teil. var. *minus* (Schmidle) Teil. 15,16. *Act. cucurbita* (Bréb.) Teil. 17. *Act. globosum* (Bulnh.) Förster 18. *Act. obcuneatum* (West) Teil. var. *orubicum* Ruzicka

Plate 13

1. *Actinotaenium turgidum* (Bréb.) Teil. var. *turgidum* 2. *Act. capax* (Joshua) Teil. var. *minus* (Schm.) Teil. 3. *Act. turgidum* (Bréb.) Teil. var. *ovatum* (Nordst.) Teil. 4. *Cosmarium pseudoconnatum* Nordst. 5. *C. variolatum* Lund. var. *foraminum* Hirano 6. *C. angulosum* Bréb. 7. *C. pyramidatum* Bréb. 8. *C. dubium* Borge 9. *C. alpestre* Roy & Bisset 10. *C. contractum* Kirchn. 11. *C. variolatum* Lund. var. *variolatum*

Plate 14

1. *Cosmarium maculatiforme* Schmidle var. *major* Gutw. 2. *C. pyramidatum* Bréb. 3. *Docidium baculum* Bréb. 4. *Cosmarium pseudotaxichondrum* Nordst. var. *siamense* W. & G.S. West 5. *C. lundellii* Delp. var. *circulare* (Reinsch) Krieger 6. *C. lundellii* Delp. f. *crassangulatum* Scott & Prescott 7. *C. nudum* (Turner) Gutw. 8. *C. varsoviense* Racib. var. *latum* (Grönblad) Krieger & Gerloff 9. *C. subtumidum* Nordst.

Plate 15

1. *Cosmarium javanicum* Nordst. var. *elongatum* Krieger & Gerloff 2. *C. lundellii* Delp. var. *ellipticum* W. West 3. *C. bengalense* (Grun.) Turner 4. *C. contractum* Kirchn. 5. *C.*

contractum Kirchn. var. *indentatum* (Grönbl.) Krieger & Gerloff 6. *C. praecisum* Borge var. *suecicum* (Borge) Krieger & Gerloff 7. *C. hammeri* Reinsch var. *schmidlei* Grönblad & Scott 8. *C. bireme* Nordst. 9. *C. moniliforme* (Turp.) Ralfs 10. *C. undulatum* Corda var. *minutum* Wittr. 11. *C. obsoletum* Hantz. 12. *C. obsoletum* var. *sitvense* Gutw. 13. *C. pseudopyramidatum* Lund. var. *pseudopyramidatum* 14. *C. pseudopyramidatum* Lund. var. *carniolicum* Lütkem. 15. *C. impressulum* Elfv. 16. *C. hammeri* Reinsch var. *protuberans* W. & G.S. West 17. *C. norimbergense* Reisch var. *depressum* W. & G.S. West 18. *C. tithophorum* Nordst. var. *depressum* W. & G.S. West 19. *C. laeve* Rabenh. var. *messikom-meri* Croasdale

Plate 16

1. *Cosmarium pseudopyramidatum* Lund. var. *excavatum* Nordst. 2. *C. perpastum* Turner 3. *C. sexangulare* Lund. 4. *C. depressum* (Näg.) Lund. 5. *C. subauriculatum* W. & G.S. West var. *truncatum* W. & G.S. West 6. *C. moniliforme* (Turp.) Ralfs var. *pandriiforme* (Heimerl) Schmidle 7. *C. subcucumis* Schm. 8. *C. hypochondrum* Scott & Grönblad 9. *C. medioscrobiculatum* W. & G.S. West var. *egranulatum* Gutw. 10. *C. depressum* (Näg.) Lund. var. *minutum* (Heimerl) Krieg. & Gerloff 11. *C. tijbenogense* Gutw. f. *minus* G.S. West 12,13. *C. boergesenii* Grönblad 14. *C. pseudopyramidatum* Lund. var. *abruptum* Krieg. & Gerloff 15. *C. trilobulatum* Reinsch 16. *C. quadratulum* (Gay) DeToni 17. *C. taticum* Racid. var. *groenbladii* Krieg. & Gerloff 18. *C. pseudoexiguum* Racib. 19. *C. polygonum* (Näg.) Arch. 20. *C. granatum* Bréb. 21. *C. subcucumis* Schmidle 22. *C. regnellii* Wille 23. *C. connatum* Bréb. 24. *C. variolatum* Lund. var. *polygonum* Krieg. & Gerloff 25. *C. impressulum* Elfv. var. *crenulatum* (Näg.) Krieg. 26. *C. tumidum* Lund. var. *subtile* Kirchn.

Plate 17

1. *Cosmarium pachydermum* Lund. var. *minus* Nordst. 2. *C. pseudorectangulare* Grönblad 3,4. *C. incertum* Schmidle 5. *C. urceum* W. & G.S. West 6. *C. depressum* (Näg.) Lund. var. *planktonicum* Reverdin 7,8. *C. lunatum* Delp. var. *orientale* Scott & Prescott 9. *C. tumidum* Lund. 10. *C. auriculatum* Reinsch var. *bogoriense* Bernard 11. *C. dubium* Borge 12. *C. moniliforme* (Turp.) Ralfs var. *pandriiforme* (Heimerl) Schmidle 13. *C. granatum* Bréb. 14. *C. tumidum* Lund. 15. *C. indentatum* Grönblad var. *ellipticum* Scott & Grönblad 16. *C. fullebornei* Schmidle 17. *C. tithophorum* Nordst. 18. *C. anceps* Lund. var. *undulatum* Krieg. & Gerloff 19. *C. retusifforme* (Wille) Gutw. 20. *C. sexangulare* Lund. var. *minus* Roy & Bisset 21. *C. regnellii* Wille var. *pseudoregnellii* (Messik.) Krieg. & Gerloff 22. *C. ocellatum* Eichl. & Gutw. 23. *C. angulosum* Bréb. var. *concinnum* (Rabenh.) W. & G.S. West 24. *C. depressum* (Näg.) Lund. var. *achondrum* (Boldt) W. & G.S. West 25. *C. variolatum* Lund. var. *rotundatum* (Krieg.) Messik. 26. *C. perfissum* G.S. West 27. *C. zonatum* Lund. var. *subcirculare* Scott & Grönblad f. *cylindricum* Scott & Grönblad 28. *C. pseudopyramidatum* Lund. var. *oculatum* Krieger 29. *C. undulatum* Corda var. *minutum* Wittr. 30. *C. regulare* Schmidle 31. *C. vanum* Gutw. 32. *C. stigmatosum* (Nordst.) Krieger

Plate 18

1. *Cosmarium quadratum* Ralfs 2. *C. binerve* Lund. 3,4. *C. phaseolus* Bréb. var. *elevatum* Nordst. 5. *C. clepsydra* Nordst. var. *truncatum* Gutw. 6. *C. tenue* Arch. var. *depressum* Irénée-Marie 7. *C. nitidulum* DeNot. var. *javanicum* Krieg. & Gerloff 8. *C. clepsydra* Nordst. var. *dissimile* Krieg. & Gerloff 9. *C. garrolense* Roy & Bisset var. *pyramidatum* Krieg. & Gerloff 10. *C. javanicum* Nordst. 11. *C. bioculatum* Bréb. var. *hians* W. & G.S. West 12. *C. abbreviatum* Racib. var. *minus* (W. & G.S. West) Krieg. & Gerloff 13. *C. regnesi* Reinsch var. *polonicum* (Eichl. & Gutw.) Compère 14. *C. doliforme* W. & G.S. West 15. *C. incertum* Schmidle var. *borgei* Krieg. & Gerloff 16. *C. sexangulare* Lund. var. *rotundatum* Grönblad 17. *C. borgei* (Hirano) Croasdale 18. *C. pseudoprotuberans* Kirchn. var. *kossinskajae* Krieg. & Gerloff 19. *C. prominens* Turner 20. *C. quadratulum* (Gay) DeToni 21. *C. subgranatum* (Nordst.) Lütkem. var. *borgei* Krie. & Gerloff 22. *C. hypochondrum* Scott & Grönblad var. *retusum* Scott Grönblad 23. *C. pseudopyramidatum* Lund. var. *abrup-*

tum Krieg. & Gerloff 24. *C. ozense* Hirano 25. *C. dichondrum* W. & G.S. West 26. *C. binum* Nordst. 27,29. *C. mansangense* W. & G.S. West 28. *C. pseudamoenum* Wille 30. *C. impressulum* Elfv. 31. *C. obtusatum* (Schm.) Schmidle 32. *C. zonatum* Lund. 33. *C. crispatum* Hirano 34. *C. blyttii* Wille f. *australianum* Schmidle

Plate 19

1. *Cosmarium askenasyi* Schmidle var. *latum* Scott & Prescott 2. *C. quadratum* Lund. 3. *C. bimamillatum* Krieger 4. *C. monomazum* Lund. var. *dimazum* Krieger 5. *C. scabrum* Turner 6. *C. portianum* Arch. var. *majus* Scott & Prescott 7. *C. orthostichum* Lund. var. *compactum* W. & G.S. West f. *divaricatum* Bicudo 8. *C. blyttii* Wille 9. *C. portianum* Arch. 10. *C. ceylanicum* W. & G.S. West f. *minus* Scott & Prescott

Plate 20

1. *Cosmarium striolatum* Näg. var. *nordstedtii* (Möbius) Krieger 2. *C. botrytis* Menegh. var. *paxillisporum* W. & G.S. West 3. *C. quadrum* Lund. var. *minus* Nordst. 4. *C. cuneatum* Joshua 5. *C. decachondrum* Roy & Bisset 6. *C. portianum* Arch. var. *majus* Scott & Prescott 7. *C. controversum* W. West 8. *C. decoratum* W. & G.S. West 9. *C. trachypleurum* Lund. var. *nordstedtii* Gutw. 10. *C. portianum* Arch. var. *nephroideum* Wittr. 11. *C. spinulliferum* W. & G.S. West 12. *C. varsoviense* Racib. var. *latum* (Grönblad) Krieger & Gerloff 13. *C. subcrenatum* Hantz. 14. *C. vitiosum* Scott & Grönblad var. *orientale* Scott & Prescott 15. *C. subcostatum* Nordst. var. *minus* (W. & G.S. West) Förster

Plate 21

1. *Euastrum longicolle* Nordst. var. *capitatum* W. & G.S. West 2. *E. intermedium* Cl. var. *rotundatum* Hirano var. nov. 3. *Cosmarium margaritatum* (Lund.) Roy & Bisset 4. *C. ordinatum* (Börgesens) W. & G.S. West var. *borgei* Scott & Grönblad 5. *C. biretum* Bréb. var. *biretum* 6. *C. quadrum* Lund. var. *sublatum* (Nordst.) W. & G.S. West 7. *C. torquatum* (Turner) Hirano 8. *C. armatum* Joshua 9. *C. pseudobroomei* Wille 10. *C. thailandicum* Hirano sp. nov. 11. *C. sumatranum* Krieger var. *neparense* Förster 12. *C. speciosum* Lund. var. *simplex* Nordst. 13. *C. reniforme* (Ralfs) Arch. 14. *C. crenatum* Ralfs var. *boldtiana* (Gutw.) W. & G.S. West 15. *C. ceylanicum* W. & G.S. West f. *minus* Scott & Prescott

Plate 22

1. *Tetmemorus granulatus* (Bréb.) Ralfs var. *attenuatus* W. & G.S. West 2. *T. brebissonii* (Menegh.) Ralfs var. *ansatifomis* Hirano var. nov. 3-5. *Euastrum ansatum* Ehrenb. 6. *E. ansatum* Ehrenb. var. *pyxidatum* Delp. 7. *E. ansatum* Ehrenb. var. *dideltiforme* Ducell. 8. *E. jenneri* Arch. 9. *E. luetkemuelleri* Ducell. 10. *E. sublobatum* Bréb. var. *obtusatum* (Gutw.) Krieger 11. *E. validum* W. & G.S. West 12. *E. luetkemuelleri* Ducell. 13. *E. validum* W. & G.S. West var. *glabrum* Krieger 14. *Tetmemorus laevis* (Kütz.) Ralfs var. *tropicus* Krieger

Plate 23

1. *Euastrum ansatum* Ehrenb. var. *undulatum* Hirano, var. nov. 2. *E. sinuosum* Lenorm. var. *scrobiculatum* Nordst. 3. *E. denticulatum* (Kirchn.) Gay 4,5. *E. boldtii* Schmidle 6. *E. irregulare* Maskell 7,8. *E. obesum* Joshua 9. *E. pseudocoralloides* Fritsch 10. *E. sublobatum* Bréb. var. *javanicum* (Bernard) Krieger 11. *E. indicum* Krieger var. *capitatum* Krieger 12. *E. obesum* Joshua 13. *E. sublobatum* Bréb. var. *javanicum* (Bernard) Krieger 14. *E. bipartitum* Krieger 15,16. *E. sinuosum* Lenorm var. *dideltoides* Krieger 17,18. *E. sinuosum* Lenorm. var. *reductum* W. & G.S. West 19. *E. sinuosum* Lenorm. var. *perforatum* Krieger 20. *E. sinuosum* Lenorm. var. *aboense* (Elfv.) Cedergren 21. *E. didelta* Delp. var. *bengalicum* Lagerheim

Plate 24

1. *Micrasterias moebii* (Borge) W. & G.S. West 2. *M. moebii* (Borge) W. & G.S. West var. *burmense* W. & G.S. West 3. *Euastrum horikawae* Hinode 4. *E. jenneri* Arch. 5.

E. inerme (Ralfs) Lund. var. *glabrum* Borge 6. *E. horikawae* Hinode 7. *E. pseudocorra-loides* Fritsch 8. *E. gnathophorum* W. & G.S. West

Plate 25

1. *Euastrum turgidum* Wall. 2. *E. ceylanicum* (W. & G.S. West) Krieger 3. *E. crameri* Racib. 4. *E. sinuosum* Lenorm var. *subjenneri* W. & G.S. West 5. *Arthrodesmus octocor-nis* Ehrenb. 6. *E. praemorphum* (Nordst.) Schmidle 7,8. *E. spinulosum* Delp. var. *in-ermius* (Nordst.) Nordst. 9. *E. spinulosum* Delp. 10,11. *E. sublobatum* Nordst. 12. *E. fissum* W. & G.S. West 13. *E. bidentatum* Näg.

Plate 26

1. *Euastrum bidentatum* Näg. 2,3. *E. dubium* Näg. 4. *E. denticulatum* (Kirchn.) Gay 5. *E. invaginatatum* Scott & Prescott 6. *E. politum* Krieger 7. *E. lapponicum* Schmidle 8. *E. serratum* Joshua 9. *E. subcrassum* Fritsch & Rich var. *subcapitatum* Scott & Grönblad 10,11. *E. elegans* (Bréb.) Kütz. 12. *E. binale* (Turp.) Ehrenb. 13. *E. insulare* (Wittr.) Roy 14. *E. validum* W. & G.S. West var. *subvalidum* (Behre) Förster 15. *Cosmarium ret-usiforme* (Wille) Gutw. var. *alpinum* Schmidle 16. *C. obliquum* Nordst. var. *taticum* (Gutw.) Krieger & Gerloff 17. *C. nitidulum* DeNot. var. *javanicum* Krieger & Gerloff 18. *C. decedens* (Reinsch) Racib. 19. *Micrasterias alata* Wall. 20. *M. suboblonga* Nordst. var. *tecta* Krieger 21. *M. arcuata* Bail. var. *expansa* (Bail.) Nordst. 22,23. *M. arcuata* Bail. 24. *Cosmarium blyttii* Wille 25. *C. blyttii* var. *australianum* Schmidle 26. *C. blyttii* Wille var. *novaesilvae* W. & G.S. West 27. *E. sublobatum* Bréb.

Plate 27

1. *Cosmarium praegrande* Lund. 2. *Micrasterias cunningtonii* G.S. West 3. *M. rotata* (Grev.) Ralfs var. *curvata* Hirano, var. nov. 4. *E. binale* (Turp.) Ehrenb. var. *papilliferum* Gutw. 5. *E. insulare* (Wittr.) Gay 6. *E. dubium* Näg. var. *tropicum* (W. & G.S. West) Krieger 7. *E. dilostauron* Skuja 8,9. *E. gessneri* Krieger & Bourr var. *laticeps* Scott & Pre-scott 10. *Cosmarium dispersum* Johns. var. *truncatum* (W. & G.S. West) Krieger & Gerloff 11. *E. irregulare* Maskell 12. *E. bipartitum* Krieger

Plate 28

1,2. *Micrasterias ceylanica* Fritsch var. *wallichiana* (Turner) Krieger 3. *M. rotata* (Grev.) Ralfs 4. *M. apiculata* (Ehrenb.) Menegh. var. *lacerata* Turner 5. *Euastrum dubium* Näg. 6. *M. suboblonga* Nordst. var. *tecta* Krieg. 7. *M. subdenticulaum* (Nordst.) Krieger

Plate 29

1. *Euastrum turneri* W. West 2,3. *E. exile* Joshua 4,5. *Arthrodesmus sumatranum* Scott & Prescott 6. *M. Lux* Joshua 7. *M. pinnatifida* (Kütz.) Ralfs 8. *M. tetraptera* W. & G.S. West var. *longesinuata* Krieger 9. *M. radians* Turner 10. *M. suboblonga* Nordst. 11. *Arthrodesmus apiculatus* Joshua

Plate 30

1. *Euastrum elegans* (Bréb.) Kütz. *elegans* 2. *E. elegans* var. *pseudoelegans* (Turner) W. West 3,4. *E. acanthophorum* Turner 5,6. *E. dubium* Näg. var. *tropicum* (W. & G.S. West) Krieger 7. *E. bilobum* Lütkem. 8. *M. tropica* Nordst. 9,10. *M. mahabuleshwarensis* Hob. 11. *M. mahabuleshwarensis* Hob. var. *wallichii* (Grun.) W. & G.S. West 12. *E. binale* (Turp.) Ehrenb. var. *hians* W. West

Plate 31

1. *Xanthidium antilopaeum* (Bréb.) Kütz. var. *laeve* Schmidle 2. *Arthrodesmus subulatus* Kütz. 3. *A. validus* (W. & G.S. West) Scott & Grönblad 4. *A. curvatus* Turner var. *kali-mantanus* Scott & Prescott 5. *Micrasterias tropica* Nordst. var. *polonica* Eichl. & Racib. 6. *M. ceratofera* Joshua

Plate 32

1. *Micrasterias anomala* Turner 2,3. *Arthodesmus subvalidus* Grönblad 4. *A. convergens* Ehrenb. var. *curtus* Turner 5. *A. curvatus* Turner var. *kalimantanus* Scott & Prescott 6. *A. arcuatus* Joshua 7. *A. thailandicus* Hirano, sp. nov.

Plate 33

1. *Xanthidium hastiferum* Racib. var. *javanicum* (Nordst.) Turner f. *plana* Turner 2,3. *A. bulnheimii* Racib. 4. *A. octocornis* Ehrenb. 5. *A. triangularis* Lagerh. 6. *A. gibberulus* Joshua 7. *A. bulnheimii* Racib. var. *subincus* W. & G.S. West 8. *A. curvatus* Turner var. *borgei* Scott & Prescott 9. *A. sachlanii* Scott & Prescott 10. *A. thailandicus* Hirano, sp. nov. 11. *X. superbum* Elfv.

Plate 34

- 1,2. *Xanthidium armatum* (Bréb.) Rabenh. var. *anguligerum* Krieger 3,4. *X. spinosum* (Joshua) W. & G.S. West 5. *X. freemanii* W. & G.S. West 6. *X. acanthophorum* Nordst. 7. *X. raciborskii* Gutw. 8. *Cosmarium umdulatum* Corda var. *minutum* Wittr.

Plate 35

- 1,2. *Xanthidium multispinum* Hirano, sp. nov. 3-5. *X. sexmamilatum* W. & G.S. West var. *pulneyense* Iyenger & Bai

Plate 36

1. *Xanthidium burkillii* W. & G.S. West var. *alternans* Skuja 2,3,4. *X. antilopaeum* (Bréb.) Kütz. var. *laeve* Schmidle f. *longispinum* Scott & Prescott 5. *X. controversum* W. & G.S. West 6. *X. cristatum* Bréb. var. *delpontei* Roy & Bisset 7. *Euastrum bilobum* Lütkem. var. *thailandicum* Hirano, var. nov. 8. *Staurostrum orbiculare* Roy & Bisset var. *ralfsii* W. & G.S. West 9. *St. curvatum* W. West 10. *St. retusum* Turner 11. *Anthodesmus borgei* Thomasson

Plate 37

1. *Xanthidium. superbum* Elfv. 2. *X. perissacanthum* Scott & Prescott var. *minus* Scott & Prescott 3. *Staurostrum zahlbruckneri* Lütkem. var. *mamillatum* W. & G.S. West 4. *St. leptodermum* Lund. var. *ikapoeae* (Schmidle) W. & G.S. West 5. *St. hystrix* Ralfs 6. *St. cuspidatum* Bréb. 7. *St. sublaevispinum* W. West 8. *St. clepsydra* Nordst. var. *obtusum* Nordst. 9. *St. dejectum* Bréb.

Plate 38

1. *Staurostrum freemanii* W. & G.S. West var. *nudiceps* Scott & Prescott 2. *St. corniculatum* Lund. var. *variabile* Nordst. 3,4. *St. mucronatum* Ralfs var. *subtriangulare* W. & G.S. West 5. *St. magacanthum* Lund. var. *orientale* Scott & Prescott 6. *St. bifidum* (Ehrenb.) Bréb. 7. *St. freemanii* W. & G.S. West var. *triquetrum* W. & G.S. West 8. *St. freemanii* W. & G.S. West var. *nudiceps* Scott & Prescott 9. *St. retusum* Turner var. *boreale* W. & G.S. West 10. *St. wildemaanii* Gutw. 11. *St. orbicurarum* Ralfs var. *hibernicum* W. & G.S. West 12. *St. cuspidatum* Bréb. var. *divergens* Nordst.

Plate 39

1. *Staurostrum retusum* Turner var. *boreale* W. & G.S. West 2. *St. contextum* Turner 3. *St. dickiei* Delp. f. *longispinum* Fritsch & Rich 4. *St. punctulatum* Bréb. var. *subproductum* W. & G.S. West 5. *St. unicorne* Turner 6. *St. wildemanii* Gutw. var. *majus* (W. & G.S. West) Scott & Prescott 7. *St. subcornutum* Detoni 8. *St. zahlbrocknii* Lütkem. 9. *St. prainii* W. & G.S. West var. *majus* Hirano, var. nov.

Plate 40

- 1,3. *Staurostrum brachiatum* Ralfs 2. *St. heimerlianum* Lütkem. var. *sumatranum* Scott & Prescott 4. *St. leptopus* Krieger var. *variabile* Skuja 5. *St. thienemanii* Krieger var. *calvum* Scott & Prescott 6. *St. hexacerum* (Ehrenb.) Wittr. 7. *St. dentatum* Krieger 8. *St. sub-*

gracilimum W. & G.S. West 9. *St. gracile* Ralfs 10. *St. crenulatum* (Näg.) Delp. 11. *St. polymorphum* Bréb. 12. *St. arcuatum* Nordst. var. *pseudopisciforme* (Eichl. & Gutw.) W. & G.S. West f. *alaskanum* Croasdale 13. *St. gracile* Ralfs var. *ornatum* Krieger 14. *St. ceylanicum* W. & G.S. West 15. *St. gracile* Ralfs var. *nanum* Wille 16. *St. apiculatum* Bréb. 17. *St. pterosporum* Lund. 18. *St. punctulatum* Bréb. var. *ellipticum* Lewin 19. *St. apiculatum* Bréb. 20. *St. senarium* (Ehrenb.) Ralfs

Plate 41

1. *Staurostrum saltans* Joshua var. *sumatranum* Scott & Prescott 2. *St. duacense* W. & G.S. West 3. *St. pseudosebaldi* Wolle var. *simplicius* West 4. *St. asterias* Nygaard 5. *St. xanthium* Krieger 6. *St. sonthalianum* Turner 7. *St. thienemanii* Krieger var. *triradiatum* Scott & Prescott 8. *St. excavatum* W. & G.S. West 9. *St. columbetoides* W. & G.S. West 10. *St. bigibbum* Skuja 11. *St. sebaldi* Reinsch var. *ventriverrucosum* Scott & Prescott 12. *St. gracile* Ralfs var. *ornatum* Krieger 13. *St. gracile* Ralfs f. *kriegeri* Scott & Prescott

Plate 42

1,2. *Staurostrum zonatum* Börges. var. *majus* Scott & Prescott 3,4. *St. pinnatum* Turner 5,6. *St. pinnatum* Turner var. *subpinnatum* (Schm.) West f. *robustum* Krieger 7,8. *St. tohopekaligense* Wolle var. *insigne* W. & G.S. West 9. *St. hexacerum* (Ehrenb.) Wittr. f. *pentagona* Krieger 10. *St. acanthocephalum* Skuja 11. *St. crenulatum* (Näg.) Delp. 12. *St. pinnatum* Turner var. *hydea* Krieger 13. *St. cyclofurcatum* Scott & Grönblad

Plate 43

1,2. *Staurostrum acanthastrum* W. & G.S. West 3,11. *St. sexangulare* Lund. var. *subglabrum* W. & G.S. West 4. *St. sexangulare* Lund. var. *productum* Nordst. 5,6. *St. cerastes* Lund. var. *coronatum* Krieger 7,8. *St. gracile* Ralfs 9,10. *St. gracile* Ralfs var. *coronulatum* Boldt 12,13. *St. zonatum* Börges. var. *ceylanicum* W. & G.S. West 14,15. *St. cyclofurcatum* Scott & Grönblad

Plate 44

1. *Staurostrum limneticum* Schmidle var. *burmense* W. & G.S. West 2,3. *St. omeari* Arch. 4,5. *St. subscolopacinum* W. & G.S. West 6. *St. pseudotetracerum* (Nordst.) W. & G.S. West 7,8. *St. archerii* West var. *curvatum* Hirano, var. nov. 9. *St. limneticum* Schmidle var. *burmense* W. & G.S. West 10. *St. submanfeldtii* W. & G.S. West var. *elegans* W. & G.S. West 11,12. *St. javanicum* (Nordst.) Turner var. *apiculiferum* (Turner) Krieger

Plate 45

1. *Staurostrum sexangulare* Lund. var. *productum* Nordst. 2. *St. sexangulare* Lund. var. *bidentatum* Gutw. 3,4. *St. indentatum* W. & G.S. West 5,6. *St. subsaltans* W. & G.S. West var. *indonesianum* Scott & Prescott 7. *St. leptocladum* Nordst. 8. *St. sexangulare* Lund. var. *bidentatum* Gutw.

Plate 46

1,3. *Staurostrum leptopus* Krieger var. *variabile* Skuja 2. *St. lunatum* Ralfs var. *planktonicum* W. & G.S. West 4,5. *St. sebaldi* Reinsch var. *ornatum* Nordst. 6,7. *St. sexangulare* Lund. var. *asperum* Playfair 8,9. *St. submanfeldtii* W. & G.S. West

Plate 47

1. *Staurostrum horametrum* Roy & Bisset var. *orientale* Scott & Prescott 2. *St. margaritaceum* (Ehrenb.) Ralfs 3. *St. wildemanii* Gutw. 4. *St. ensiferum* Turner 5. *St. protectum* W. & G.S. West var. *rangoonense* (Skuja) Scott & Prescott 6. *St. muticum* Bréb. 7. *St. tripyrenoideum* Scott & Prescott 8. *St. subpygmaeum* West var. *subangulatum* W. & G.S. West 9,10. *St. leptodermum* Lund. 11. *St. dickiei* Ralfs var. *circulare* Turner 12. *St. orbiculare* Ralfs var. *depressum* Roy & Bisset 13,14. *St. cuspidatum* Bréb. var. *divergens* Nordst. 15,16. *St. retusum* Turner var. *boreale* W. & G.S. West 17. *St. corniculatum* Lund. var. *spinigerum* West 18. *St. disputatum* W. & G.S. West var. *sinense* (Lütkem.) W. & G.S.

West 19,20. *St. excavatum* W. & G.S. West 21. *St. pygmaeum* Bréb. var. *obtusum* Wille 22,23. *St. corniculatum* Lund. var. *variabile* Nordst. 24. *St. freemanii* W. & G.S. West 25. *St. pygmaeum* Bréb. var. *obtusum* Wille

Plate 48

1,2. *Staurostrum acanthastrum* W. & G.S. West 3. *St. xanthium* Krieger 4,5. *St. tauphorum* W. & G.S. West 6. *St. perundulatum* Grönblad 7,8. *St. smithii* (G.S. West) Teil. 9. *St. saltans* Joshua var. *polyserax* Scott & prescott 10,11. *St. calyxoides* Wolle var. *orientale* Scott & Prescott 12. *St. pseudozonatum* Borge var. *sumatranum* Krieger 13,14. *St. setigerum* Cleve 15. *St. hantzschii* var. *japonicum* Roy & Bisset 16. *St. pseudozonatum* Borge var. *sumatranum* Krieg.

Plate 49

1. *Staurostrum freemanii* W. & G.S. West var. *triquetrum* W. & G.S. West 2. *St. striolatum* (Näg.) Arch. var. *divergens* W. & G.S. West 3,4. *St. abruptum* W. & G.S. West 5. *St. protectum* W. & G.S. West var. *rangoonense* (Skuja) Scott & Prescott 6. *St. zahlbruckneri* Lütke. var. *mamillatum* W. & G.S. West 7. *St. cerastes* Lund. var. *pulchrum* Scott & Grönblad 8. *St. connatum* (Lund.) Roy & Bisset 9,10. *St. curvatum* W. West 11. *St. inconspicuum* Nordst. var. *crassum* Gay 12,13. *St. curvatum* W. West 14,15. *St. tenuissimum* W. & G.S. West 16. *St. heimerlianum* Lütke. var. *sumatranum* Scott & Prescott 17. *Arthrodesmus curvatus* Turner var. *latus* Scott & Prescott 18. *St. subsaltans* W. & G.S. West var. *indonesianum* Scott & Prescott

Plate 50

1. *Onychonema laeve* Nordst. var. *hexagonum* var. nov. 2. *Desmidium suboccidentale* Scott & Prescott 3. *D. quadratum* Nordst. 4. *O. laeve* Nordst. var. *laeve* 5. *Staurostrum archerii* West var. *archerii* 6. *Desmidium graciliceps* (Nordst.) Lagerh. 7. *D. aptogonum* Bréb. var. *tetragonum* W. & G.S. West 8. *Hyalotheca dissiliens* (Sm.) Bréb. var. *hians* Wolle 9. *H. dissiliens* (Sm.) Bréb. var. *dissiliens* 10,11. *Haplozyga armata* (Lefg. & Nordst.) Racib. var. *raciborskii* Förster 12. *Spondylosium nitens* (Wall.) Kirchn. var. *triangulare* Turner 13. *Sp. nitens* (Wall.) Arch. var. *javanicum* (Gutw.) Grönblad 14-16. *Sp. planum* (Wille) W. & G.S. West 15. *Hyalotheca dissiliens* (Sm.) Bréb. var. *tatrica* Racib.

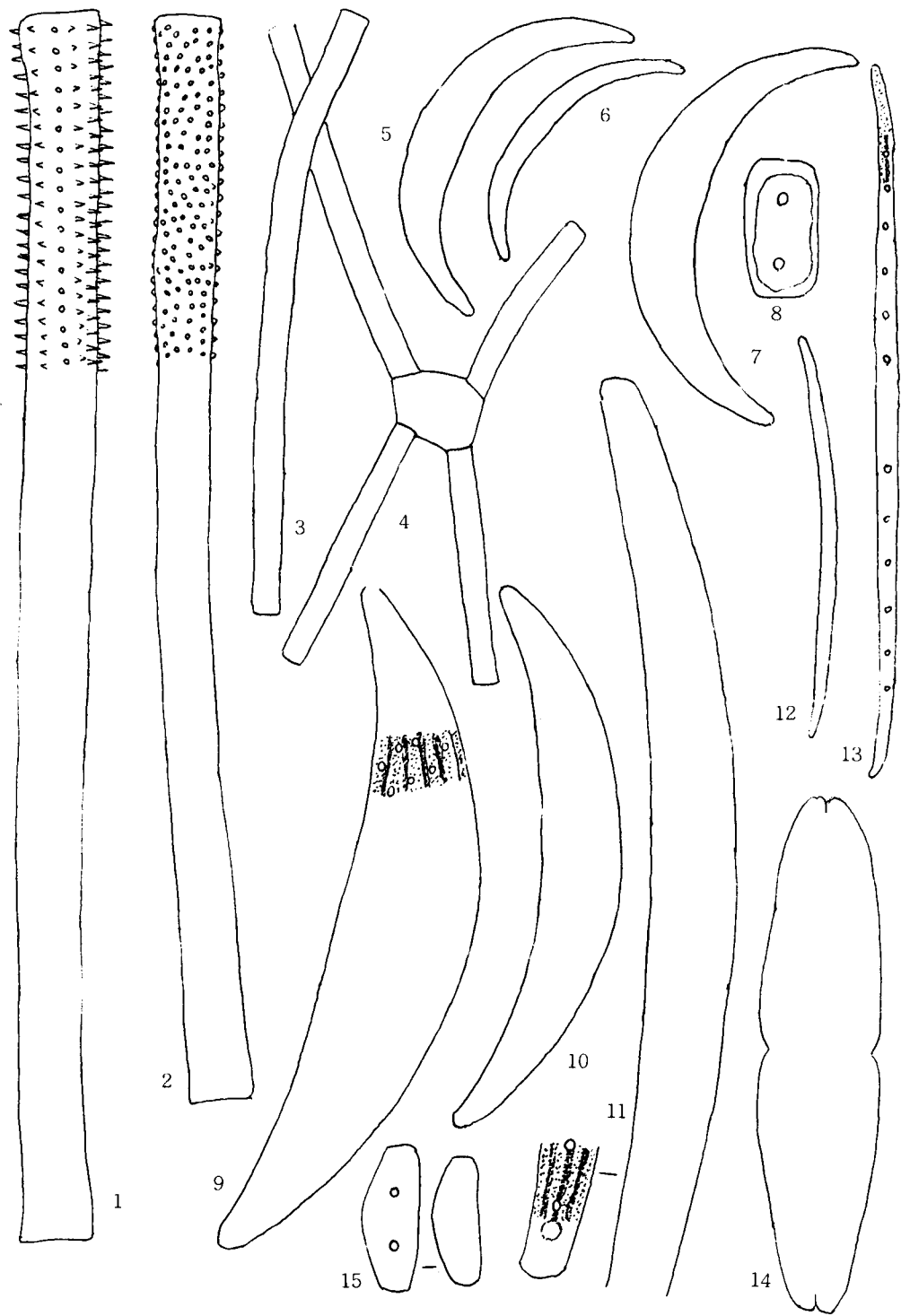
Plate 51

1. *Groenbladia neglecta* (Racib.) Teil. var. *elongata* Scott & Prescott 2,3. *G. neglecta* (Racib.) Teil. var. *neglecta* 4. *Bambusina brebissonii* Kütz. 5. *Bamb. brebissonii* Kütz. var. *gracilescens* Nordst. 6,7. *D. gracilices* (Nordst.) Lagerh. 8. *D. quadratum* Nordst. 9. *Hyalotheca undulata* Nordst. var. *perundulata* Grönblad 10. *Teilingia excavata* (Ralfs) Bourrelly 11. *Desmidium pseudostreptonema* W. & G.S. West 12. *D. swartzii* Ag. 13. *D. coarctatum* Nordst. 14. *Euastrum exile* Joshua var. *latum* Hirano, var. nov. 15,16. *Staurostrum pachyrhynchiforme* Hirano, sp. nov. 17. *St. furcatum* (Ehrenb.) Bréb. var. *asymmetricum* Grönblad 18. *Cosmarium moniliforme* (Turp.) Ralfs var. *indentatum* Scott & Grönblad 19. *Staurostrum subsaltans* W. & G.S. West 20. *Cosmarium divergens* Krieger

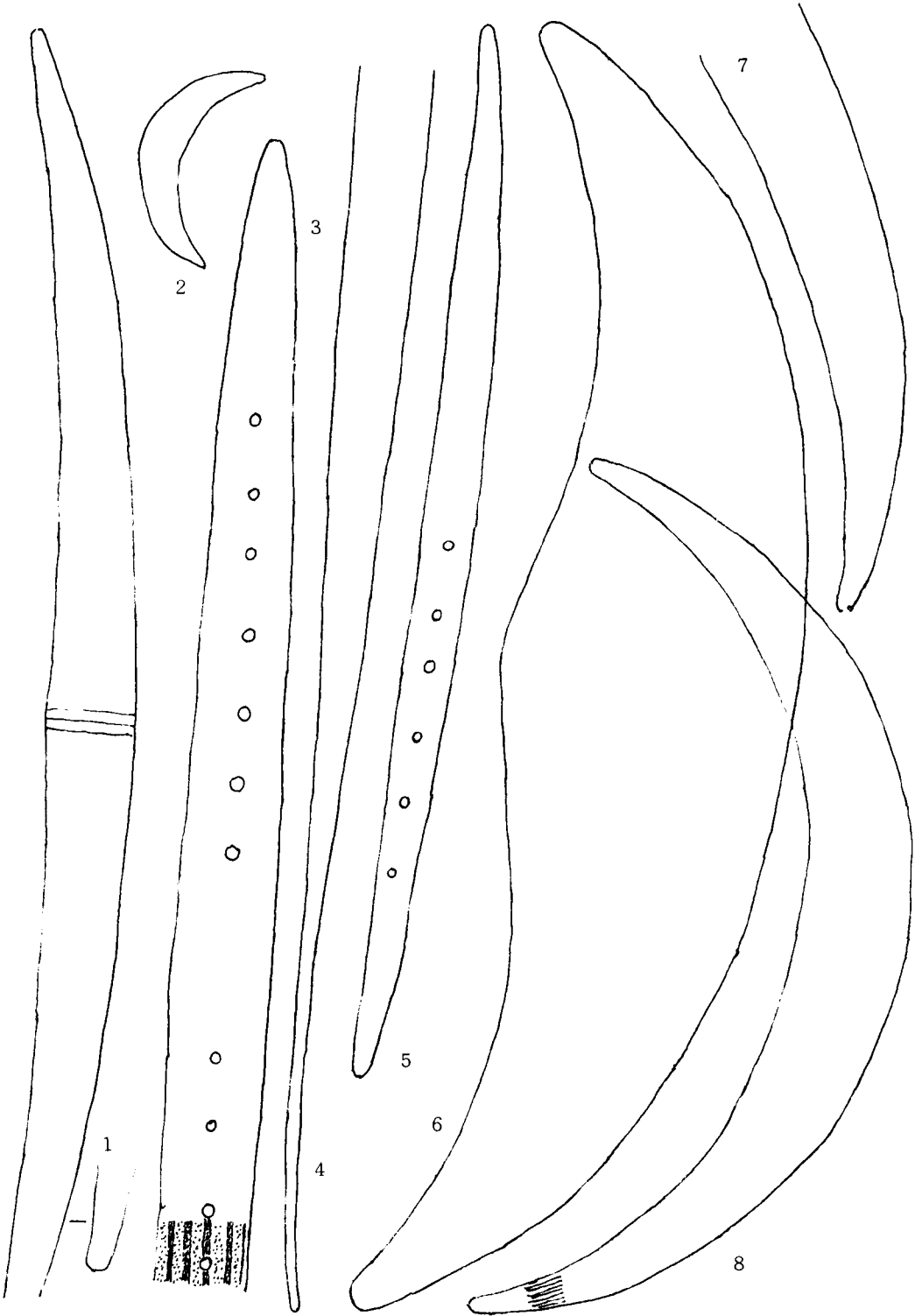
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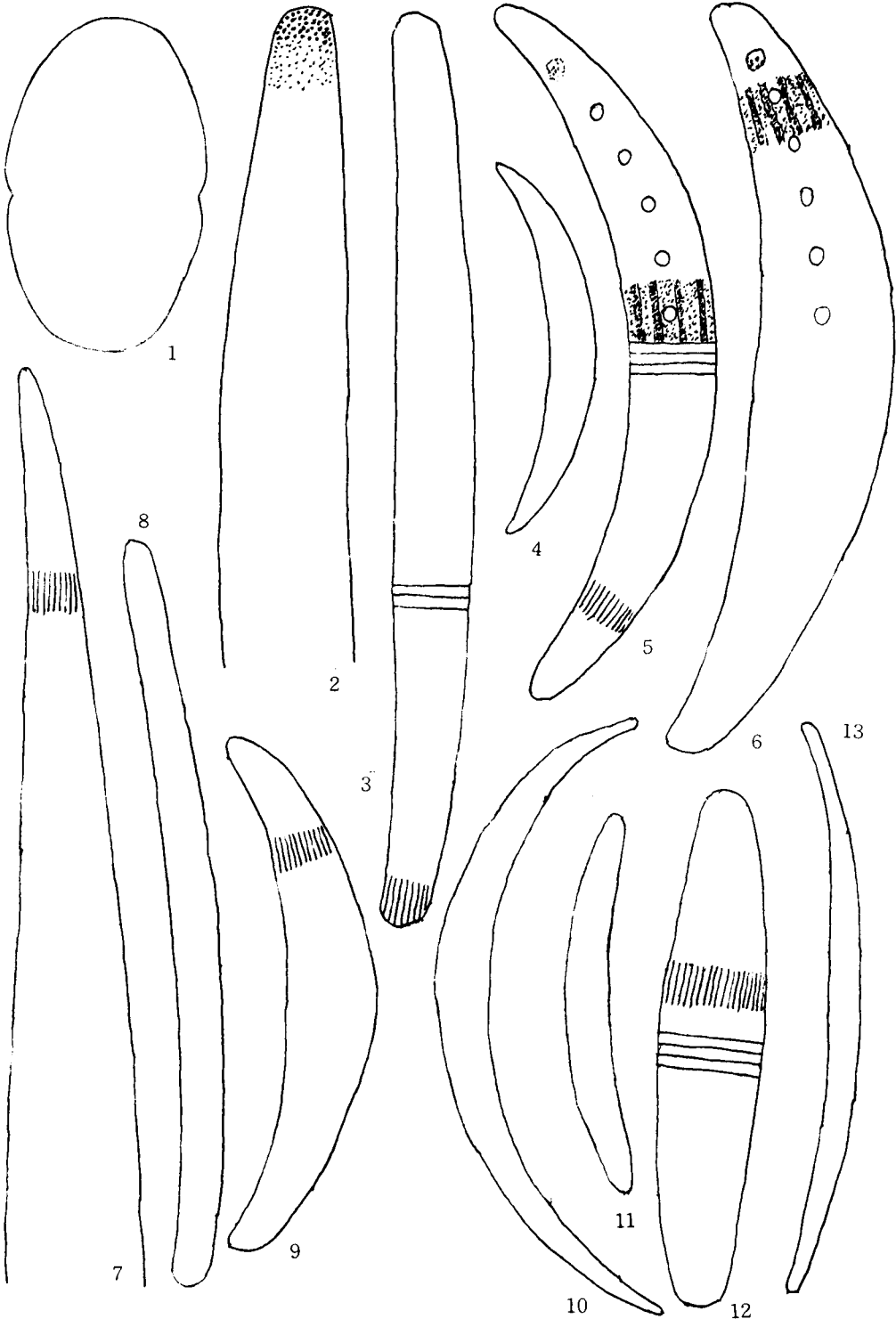
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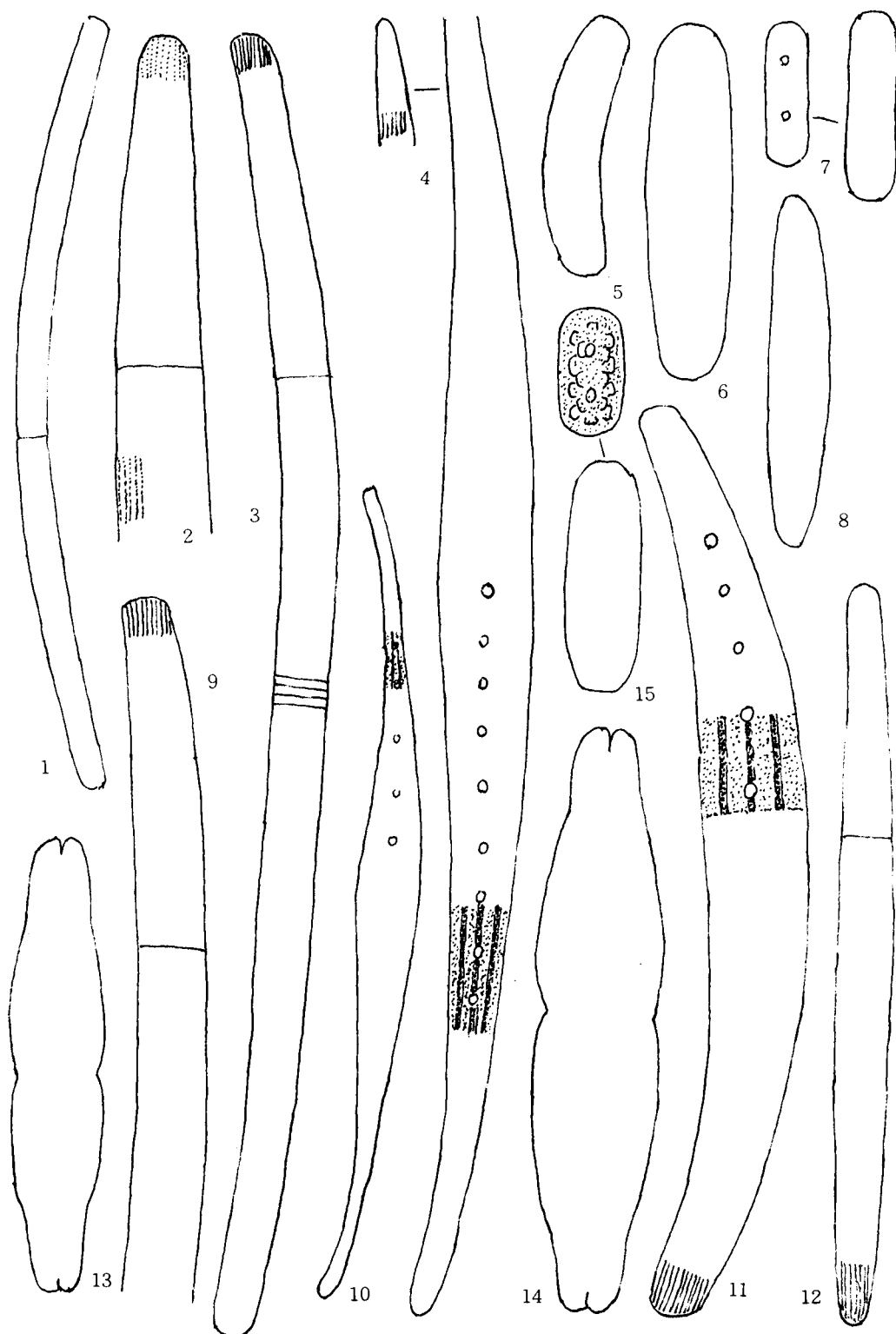
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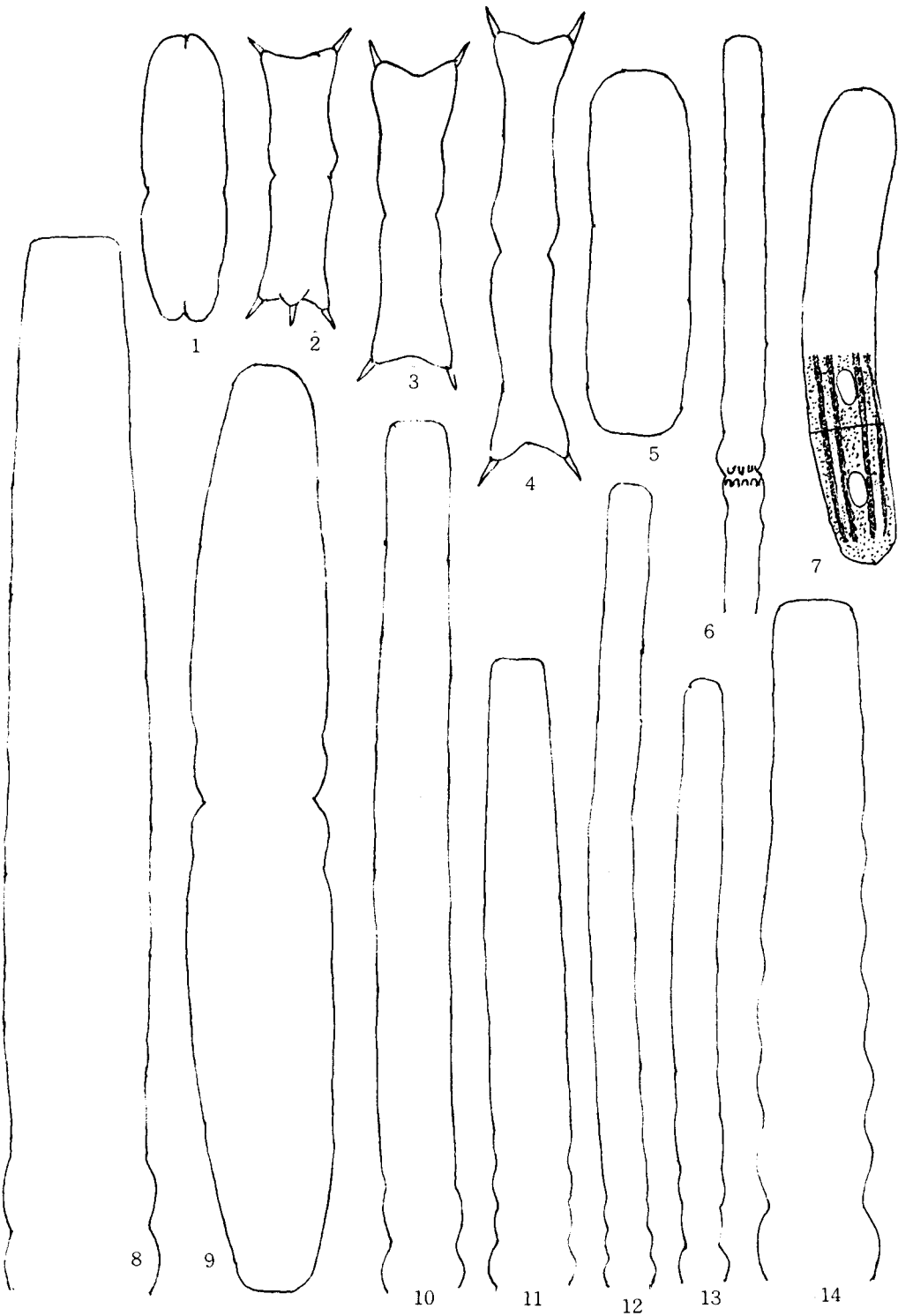
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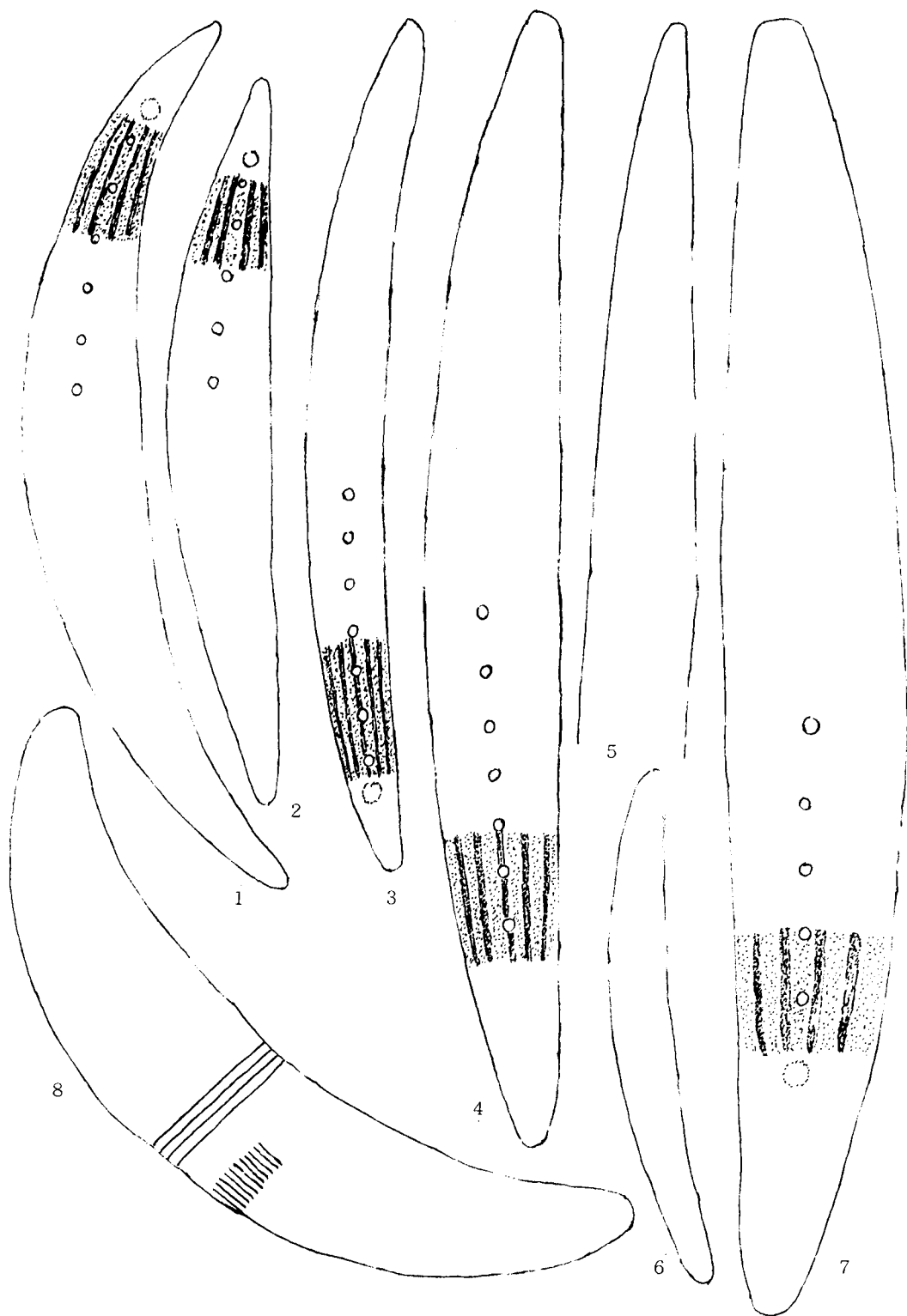
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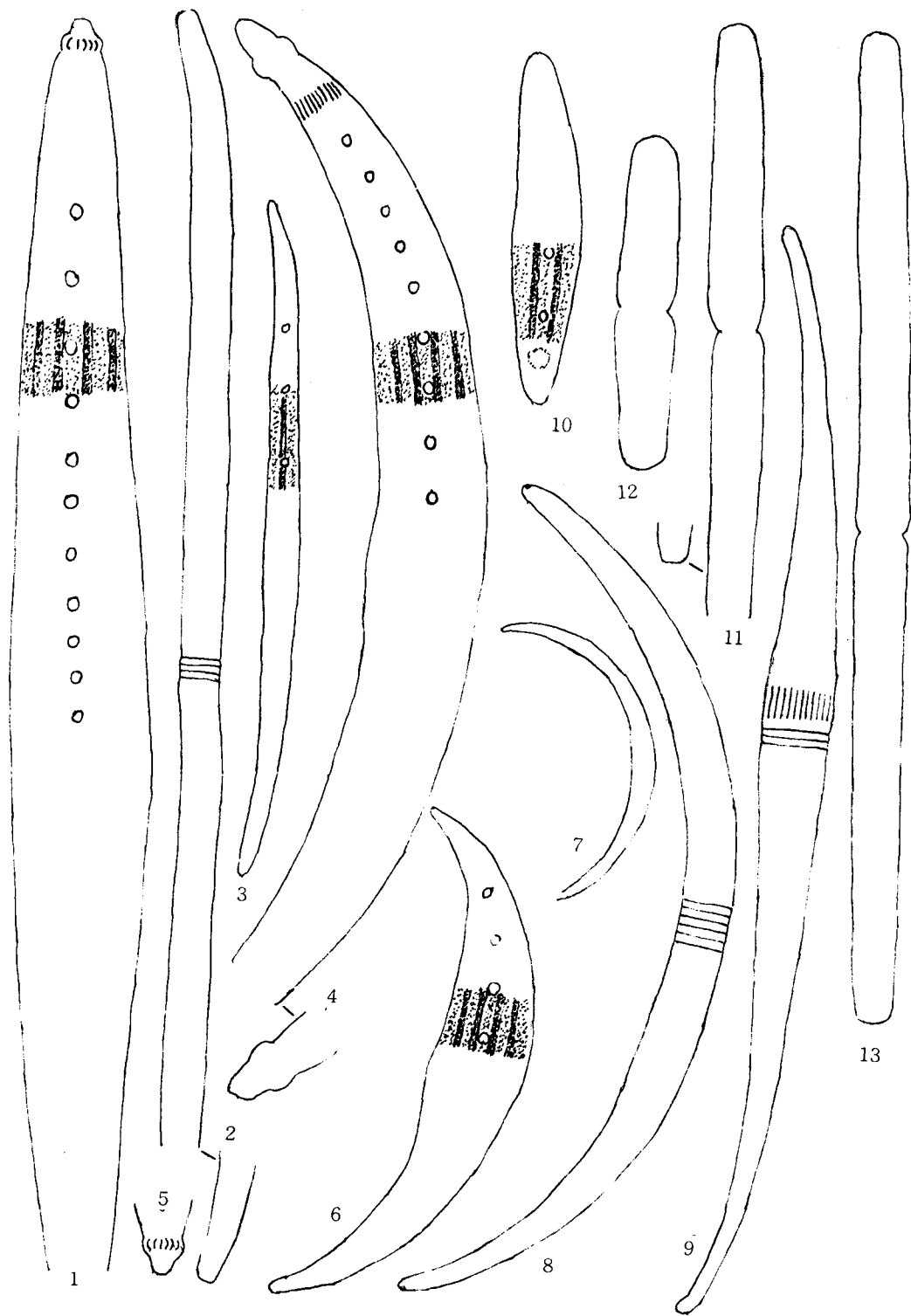
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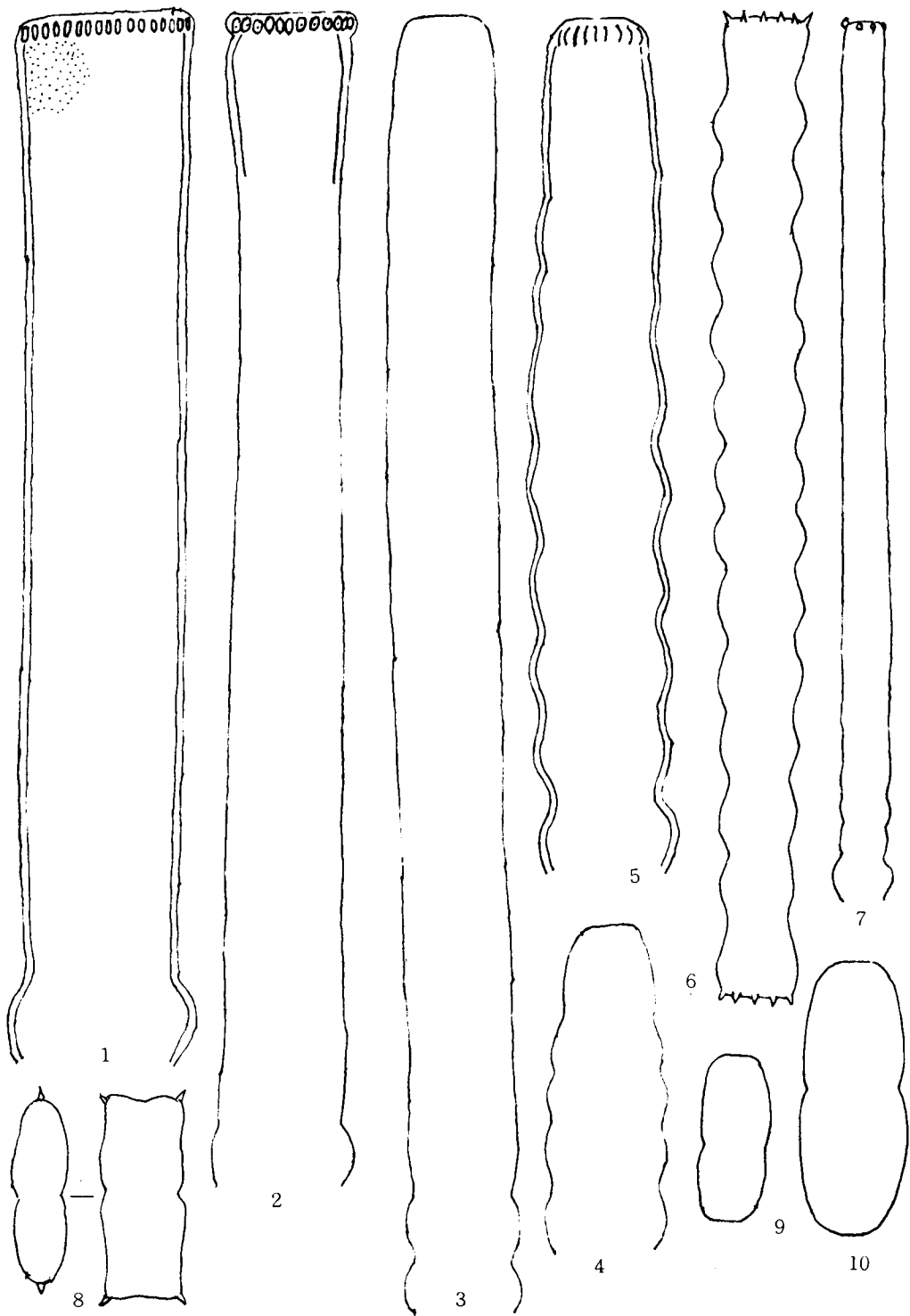
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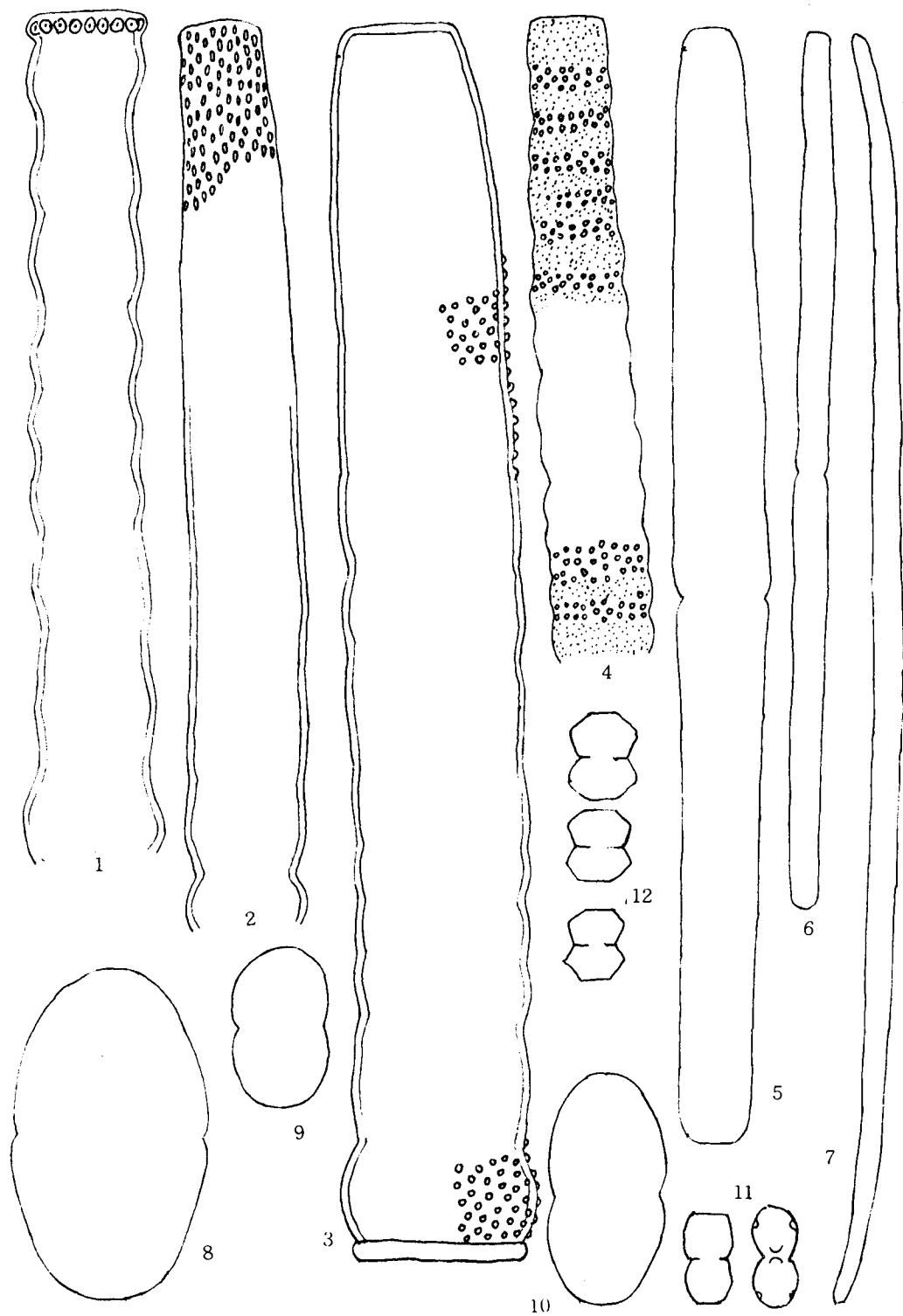
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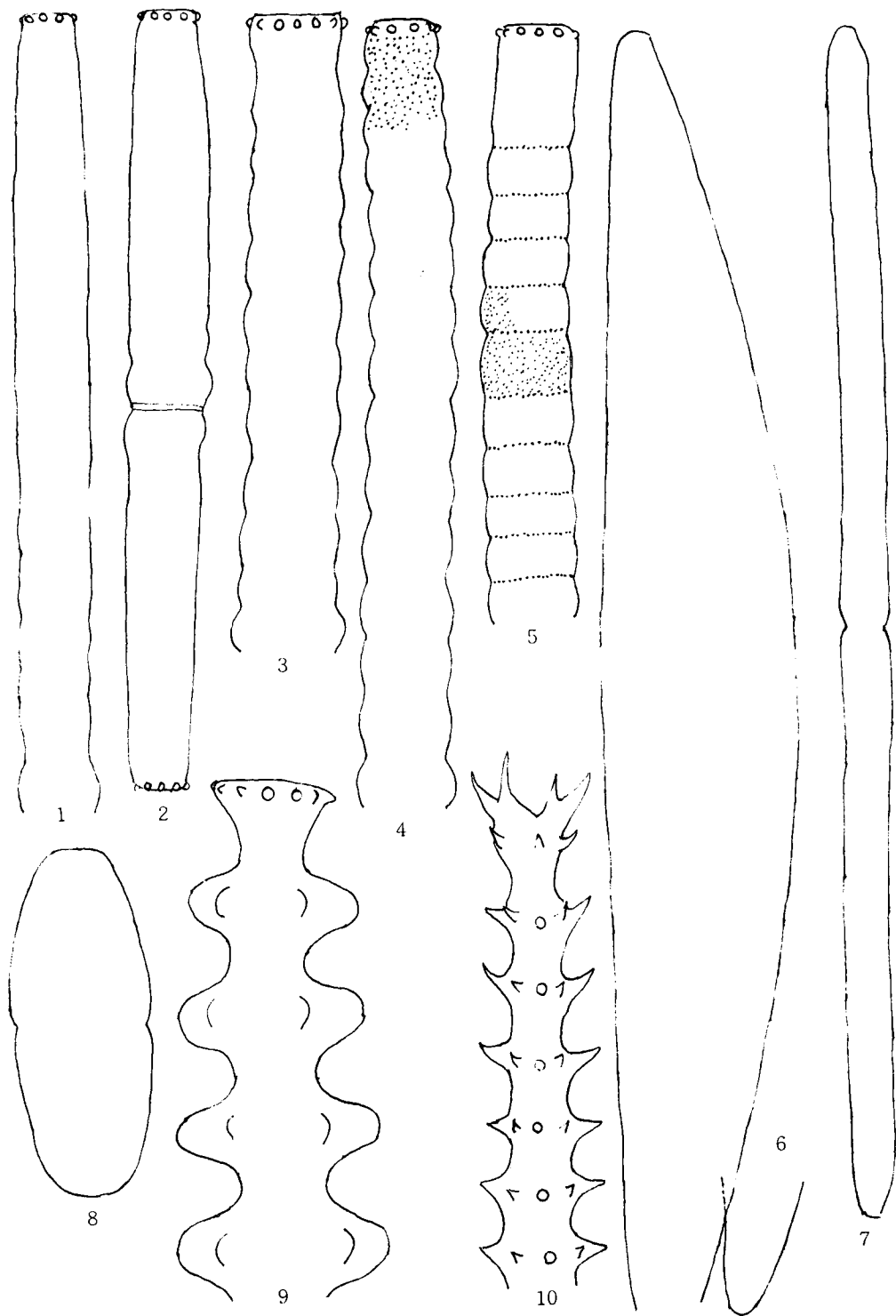
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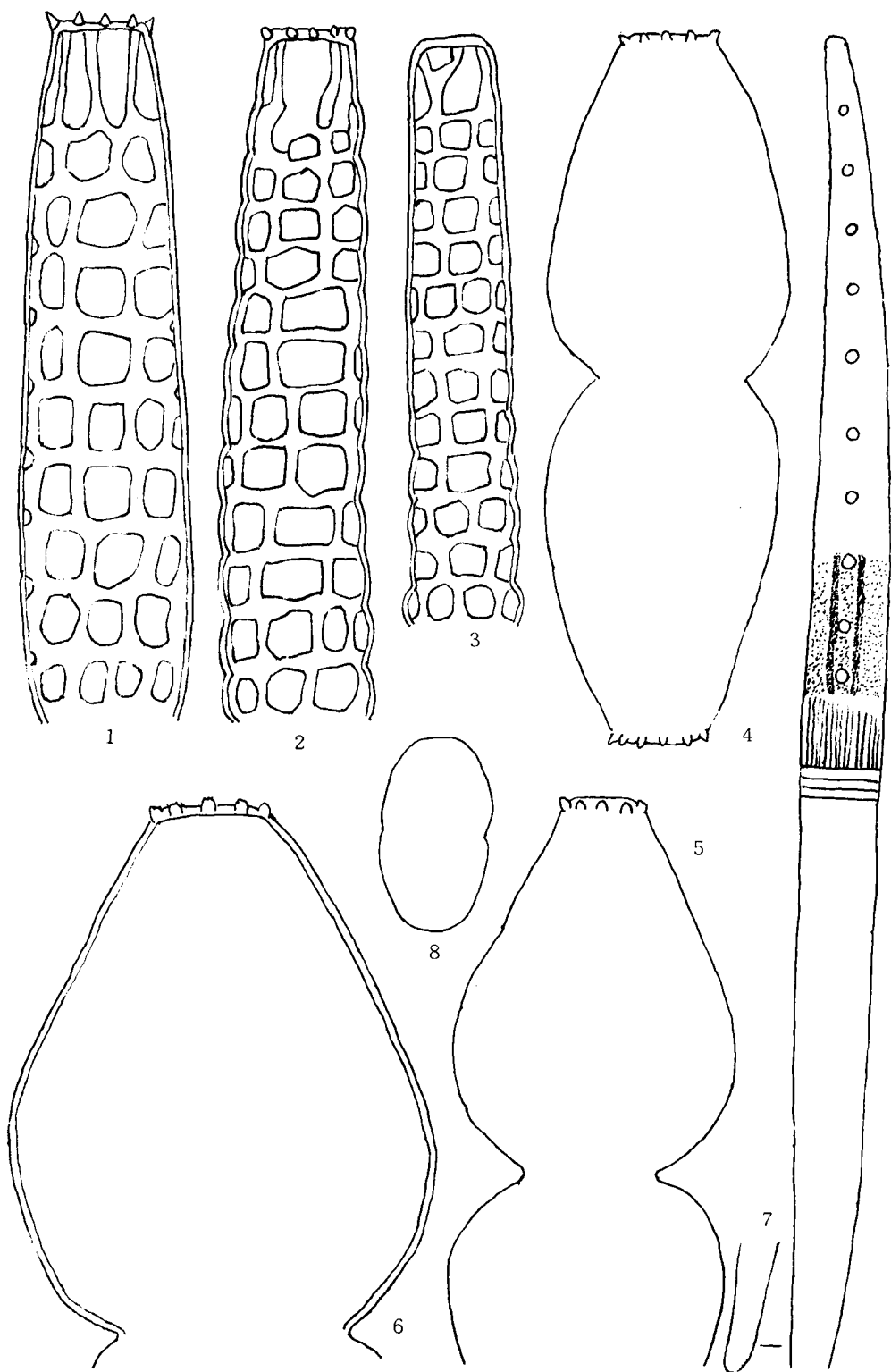
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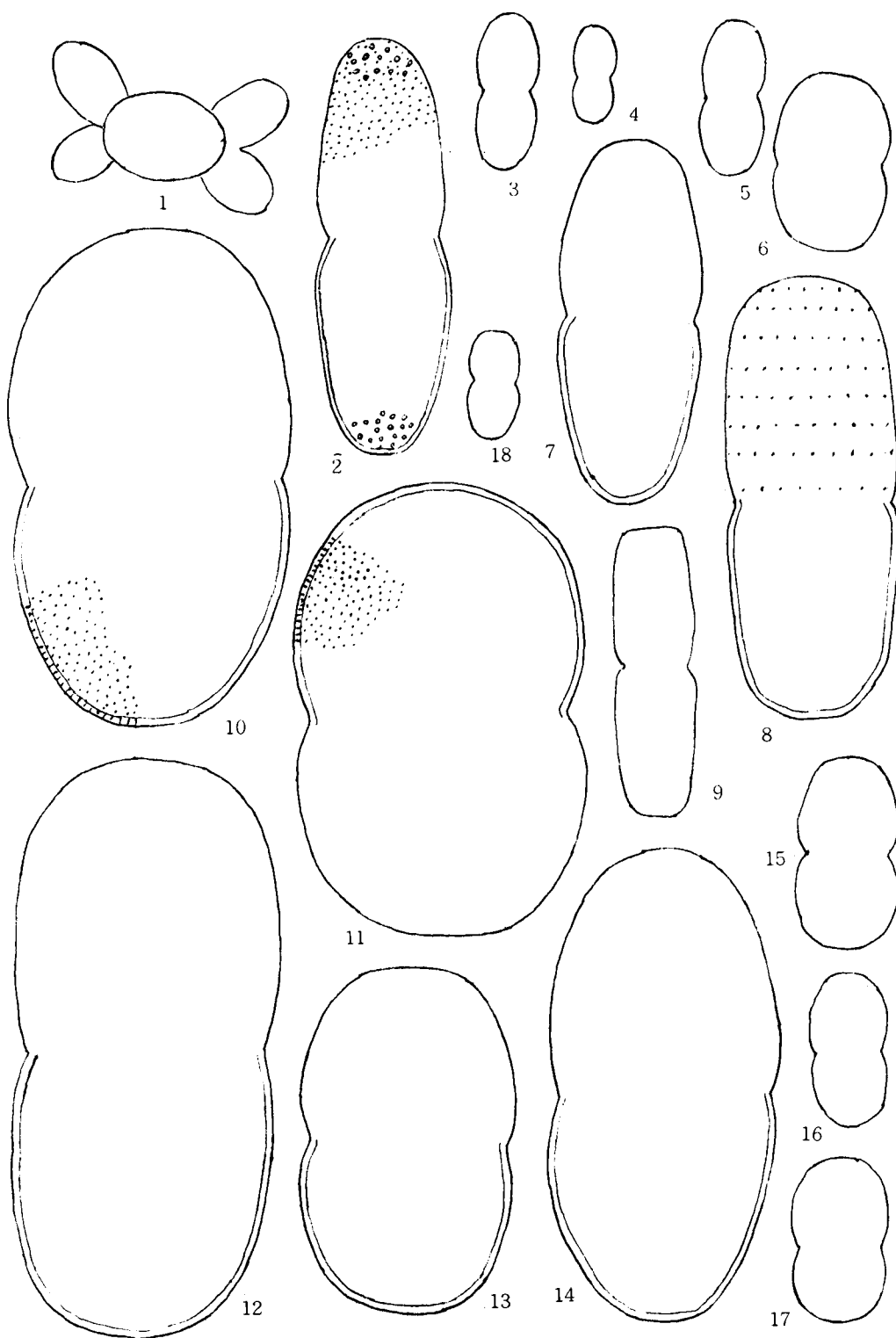
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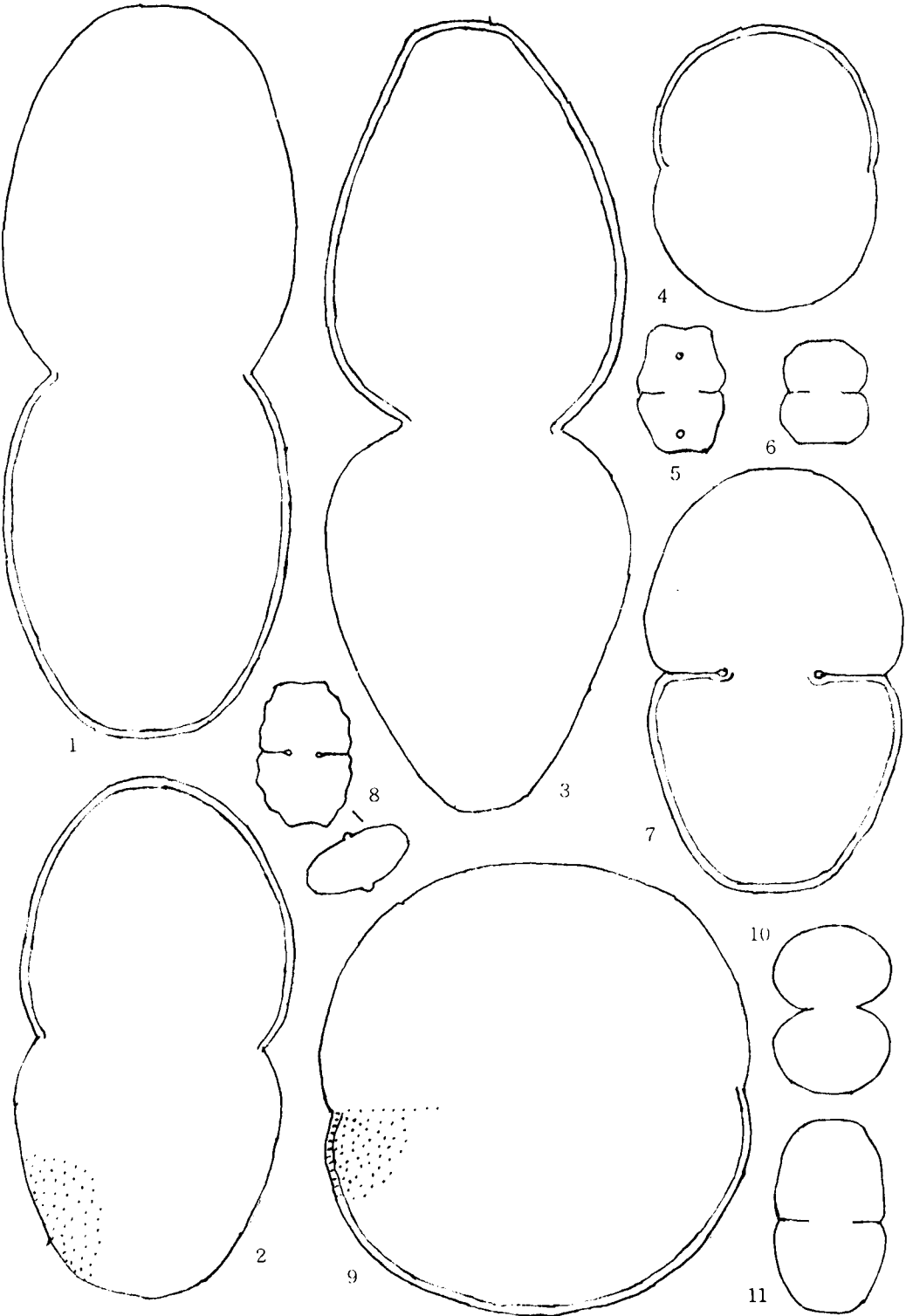


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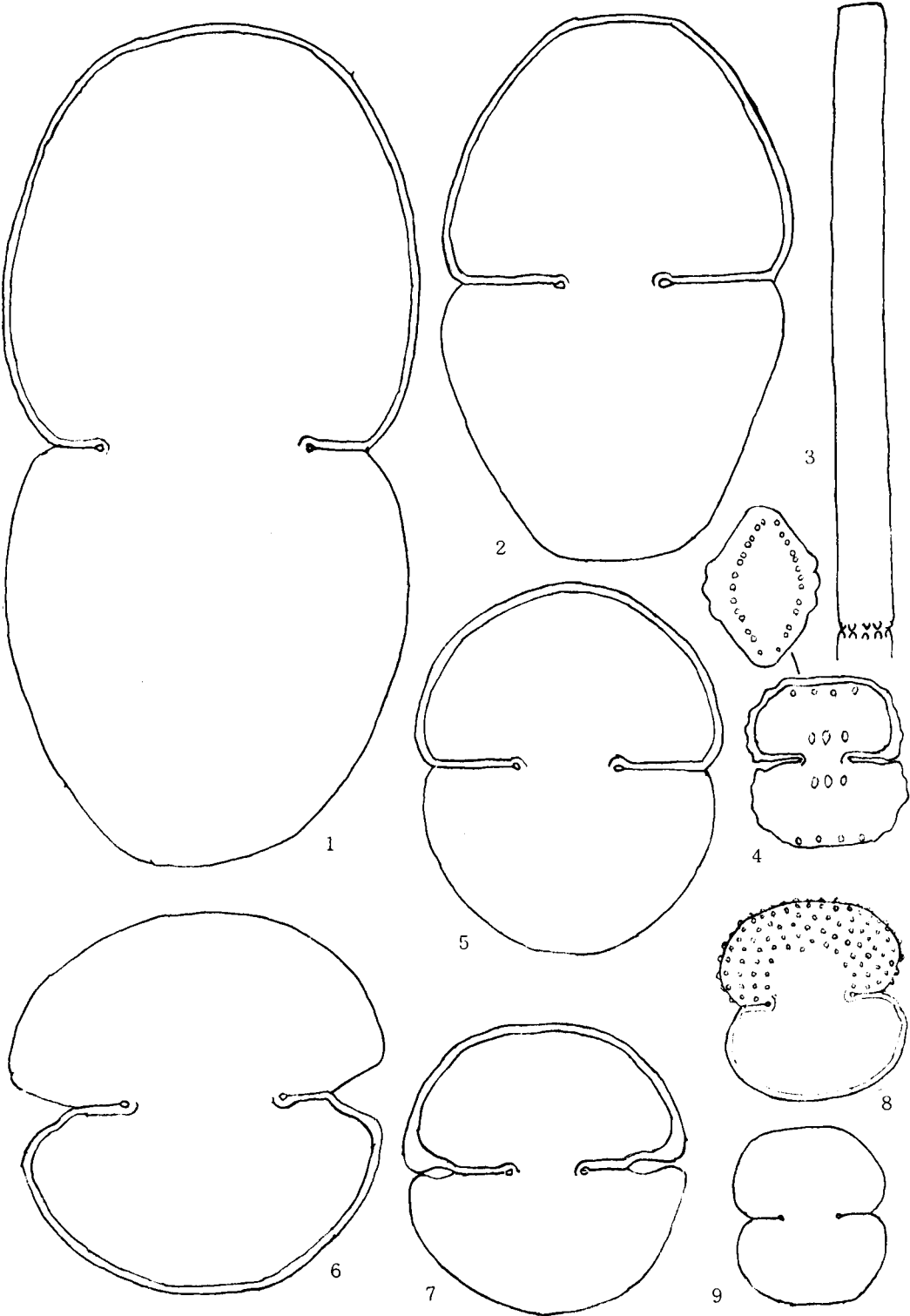


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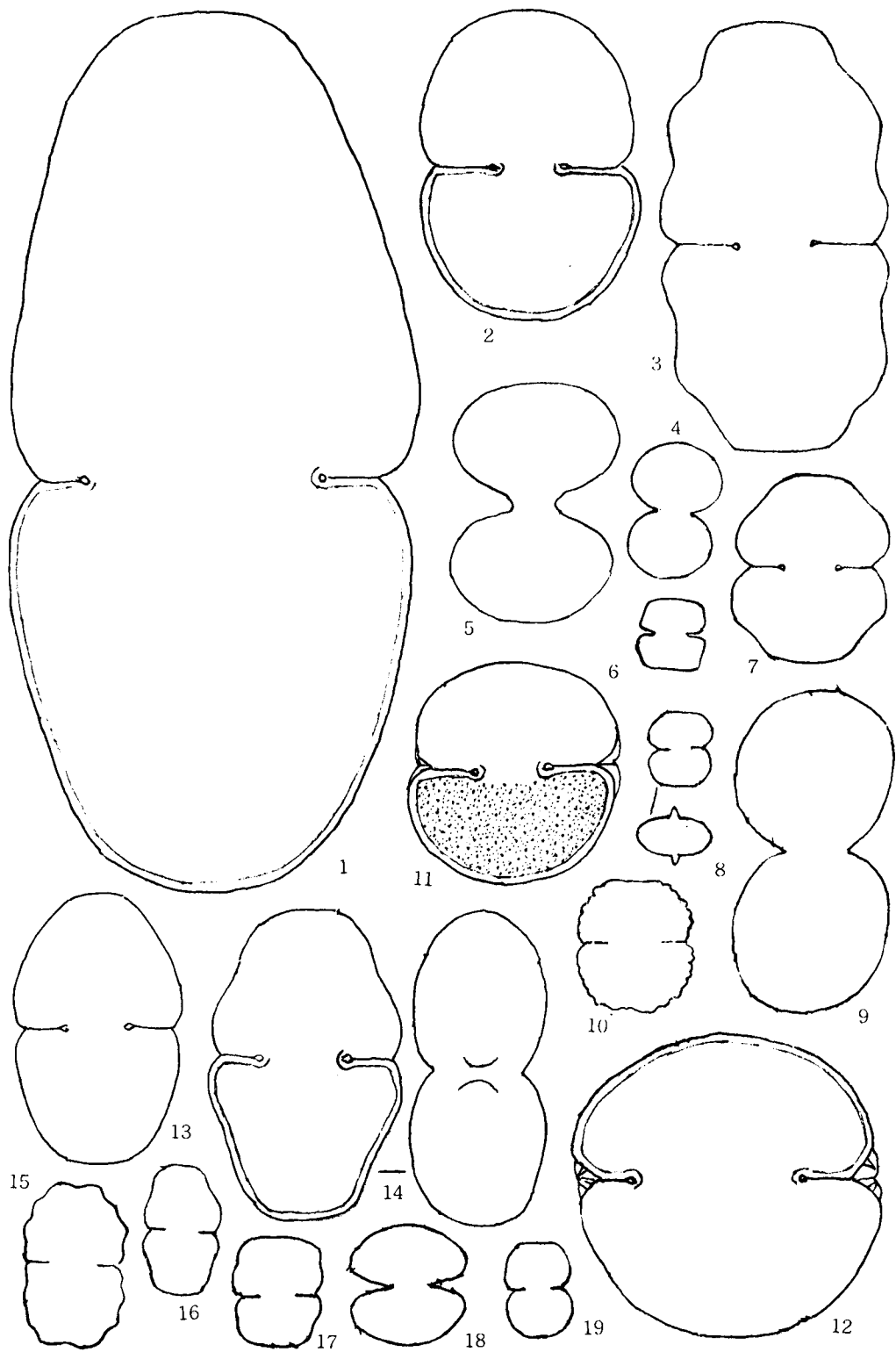




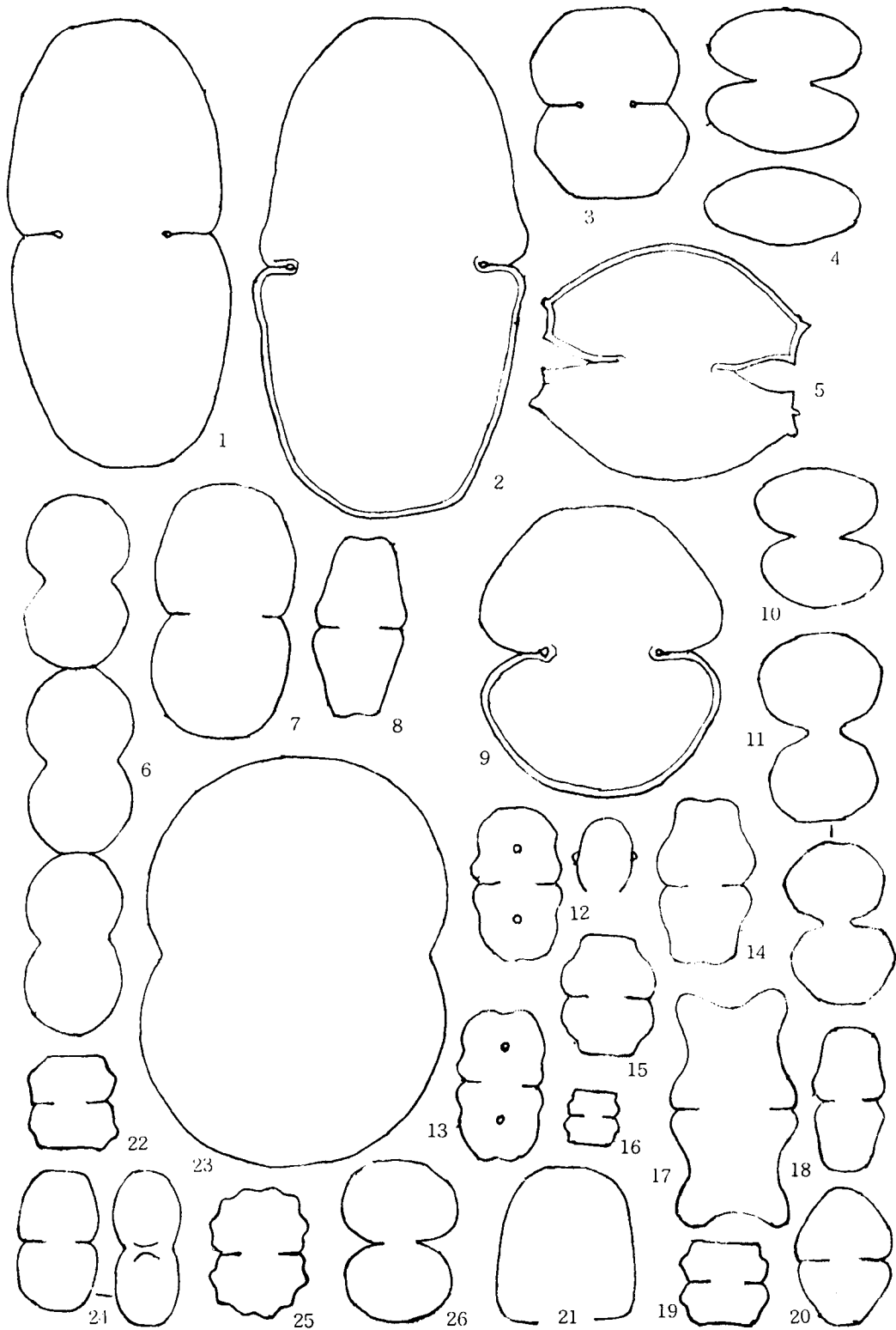
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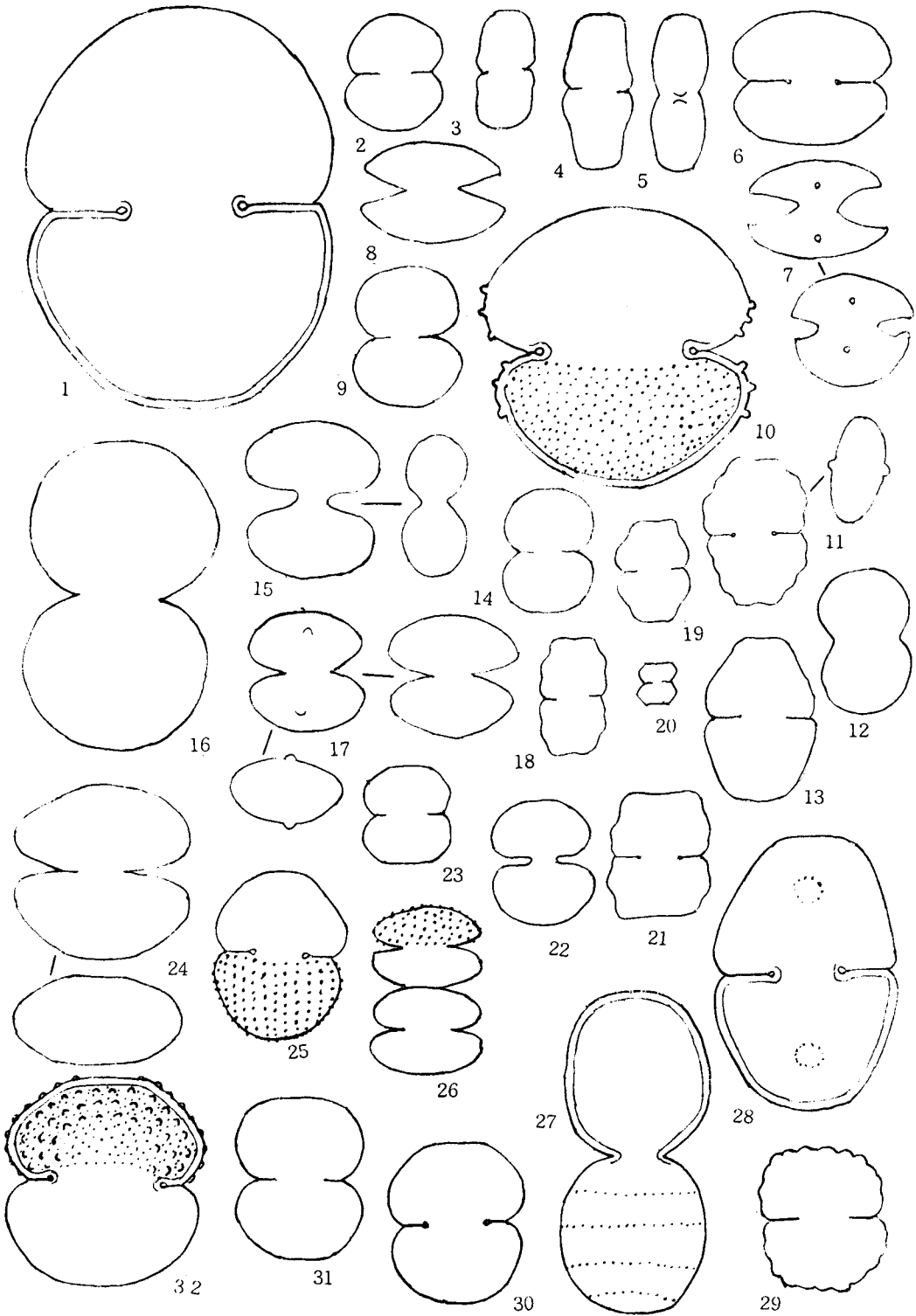
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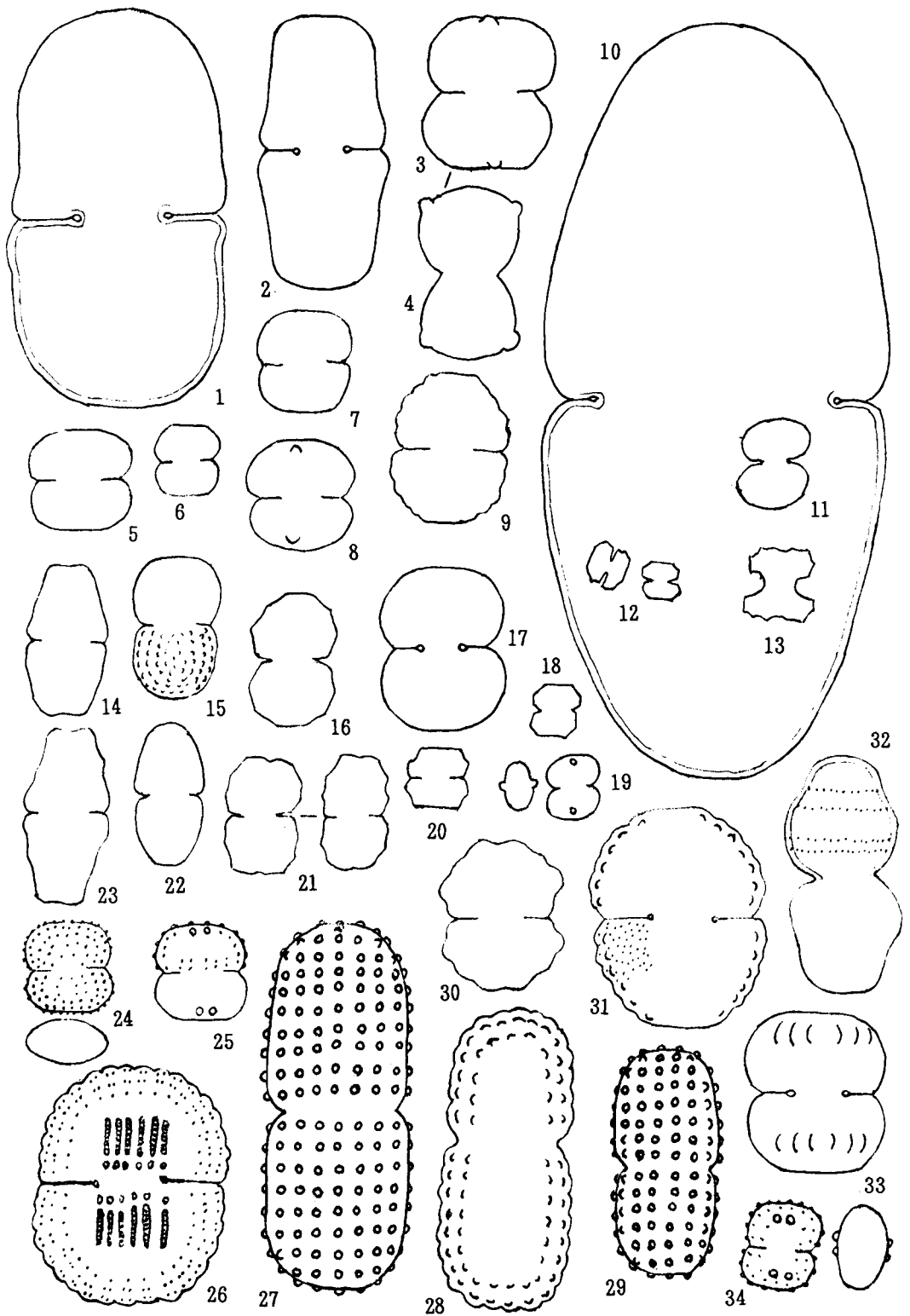
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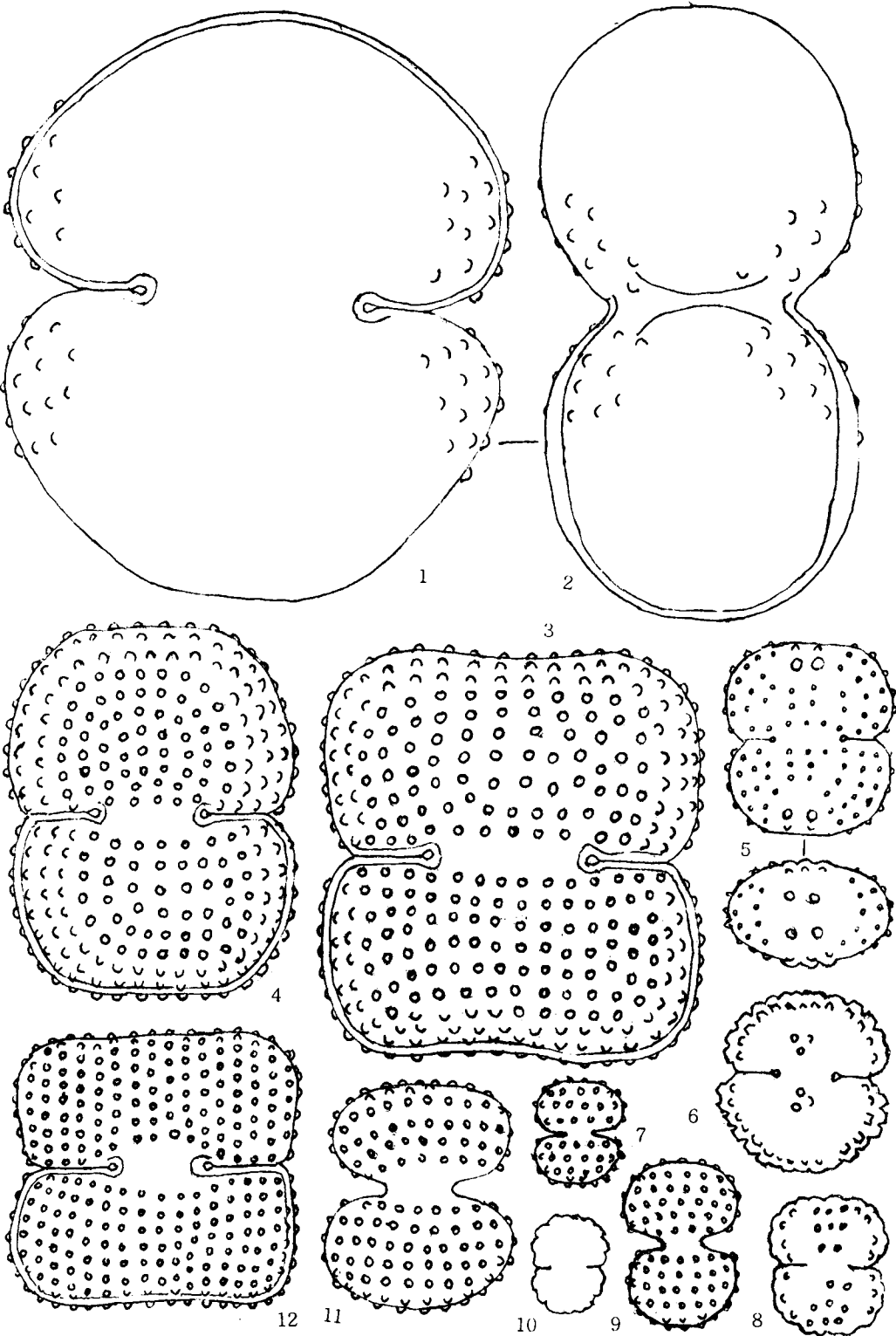


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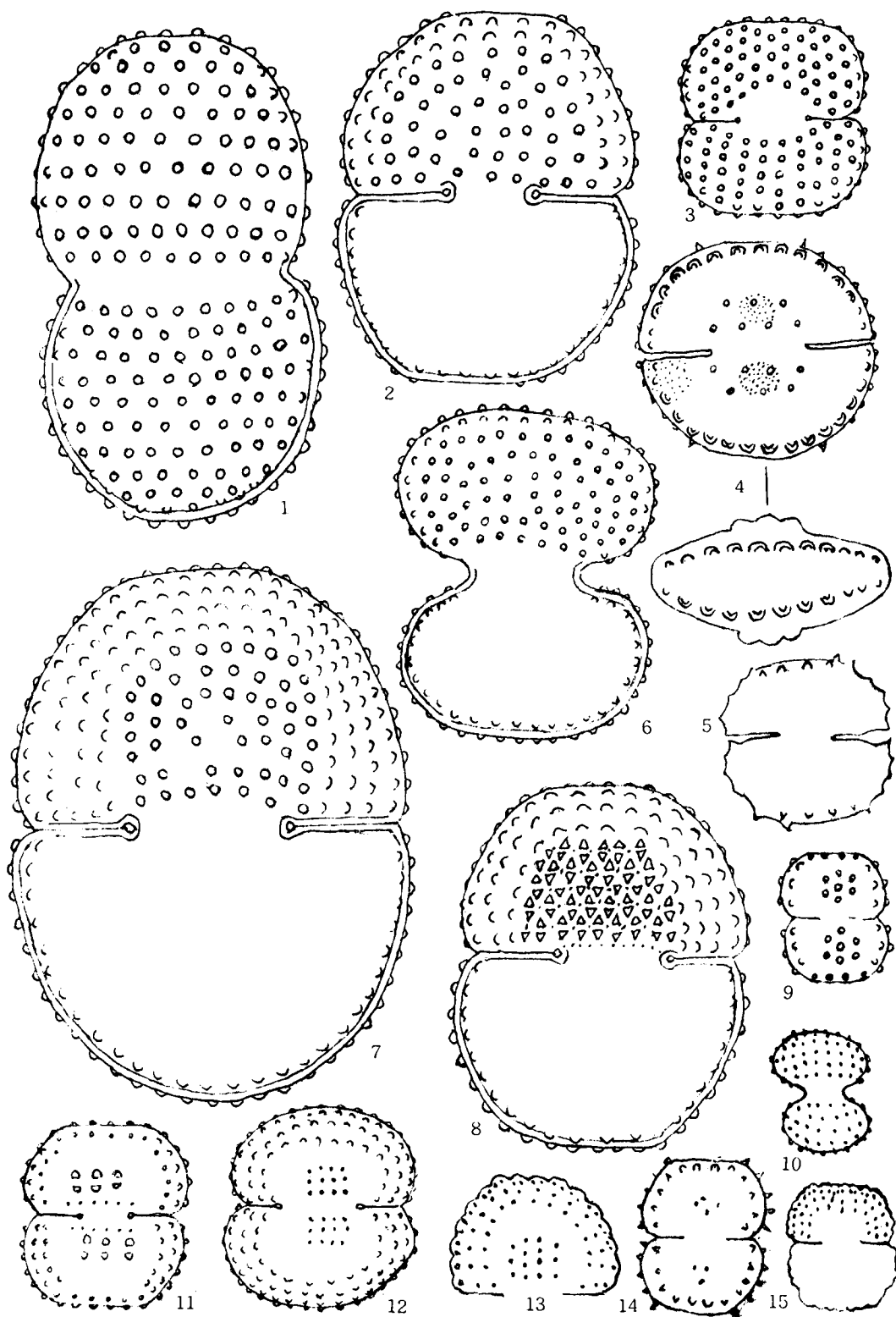


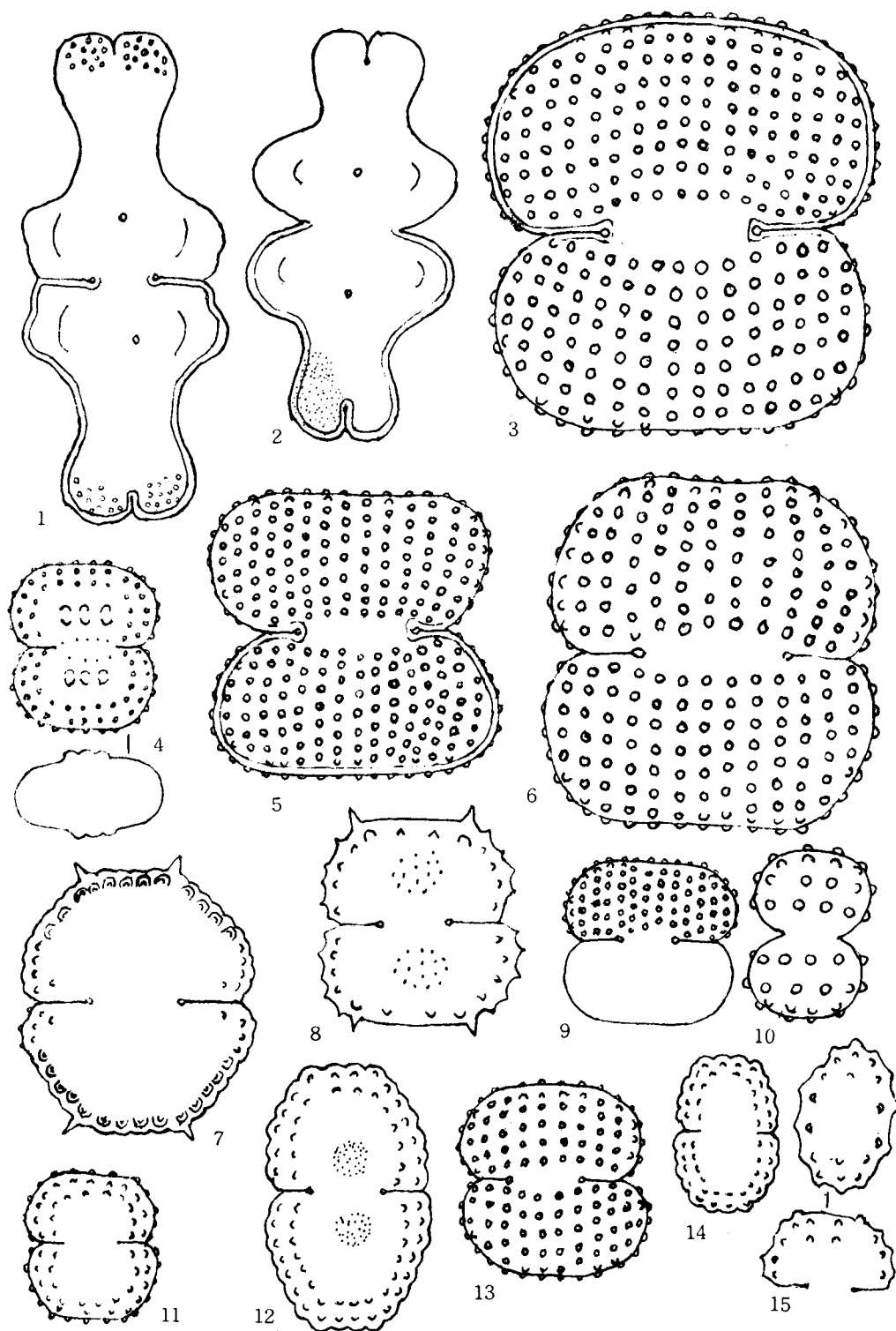
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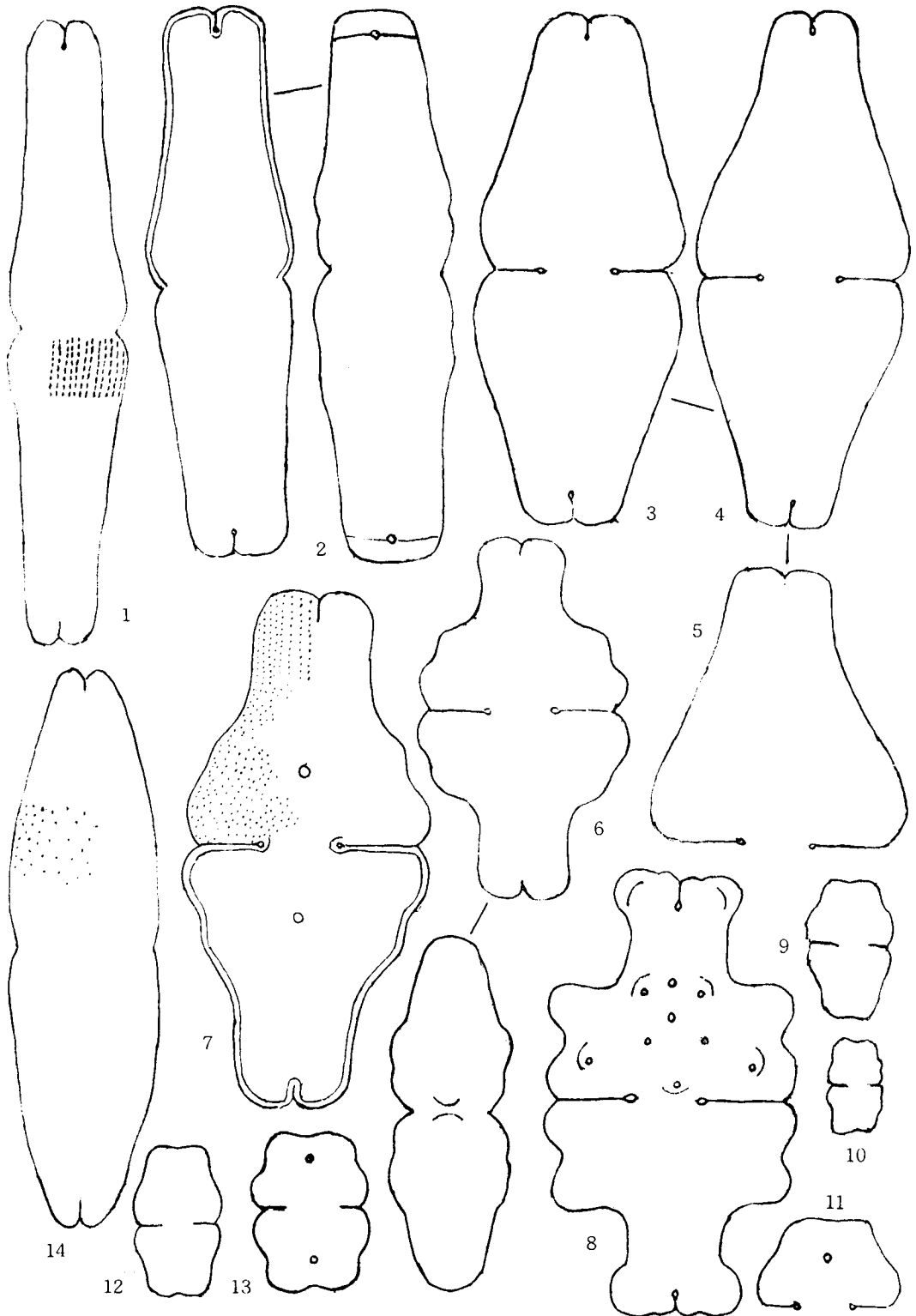


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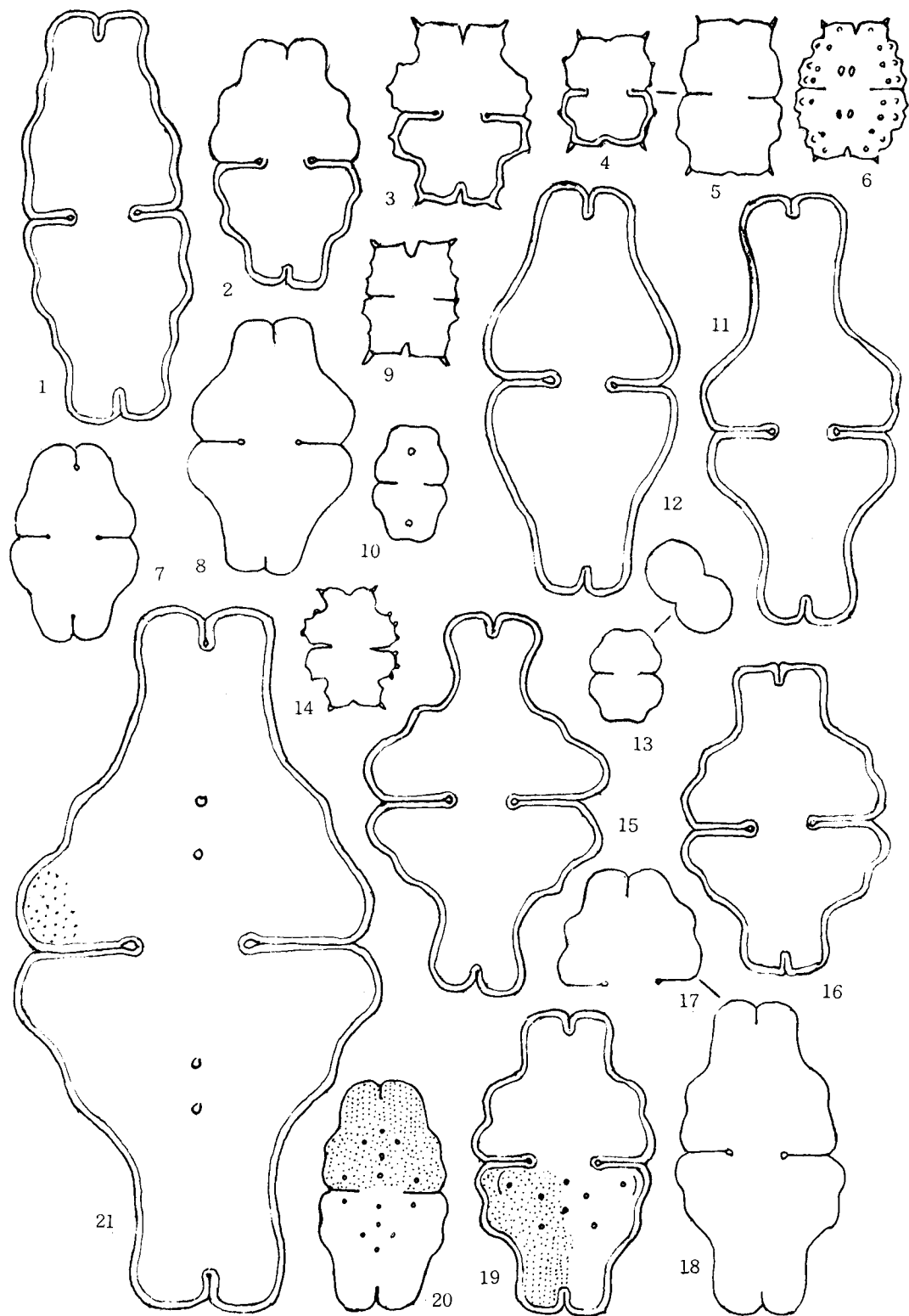




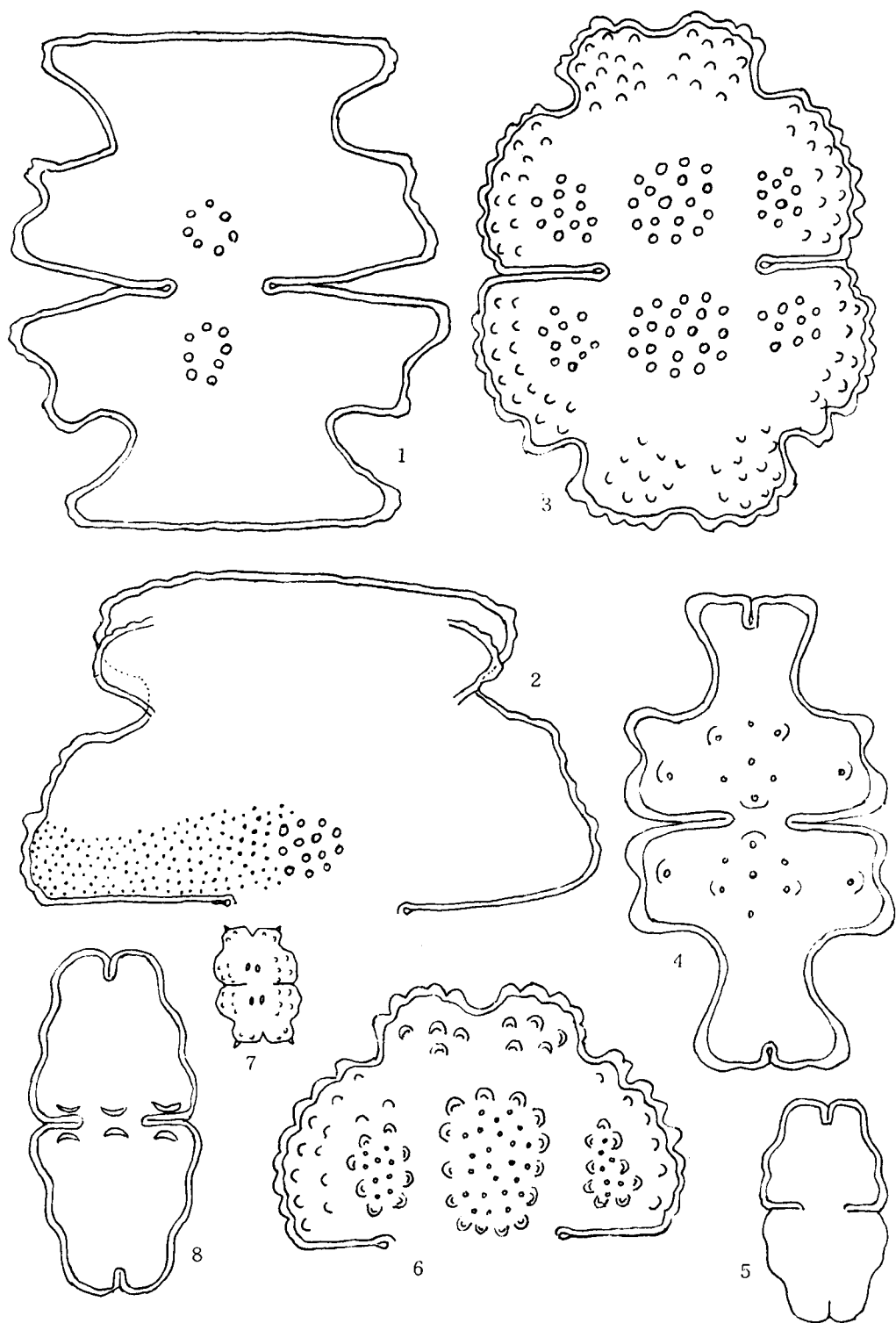
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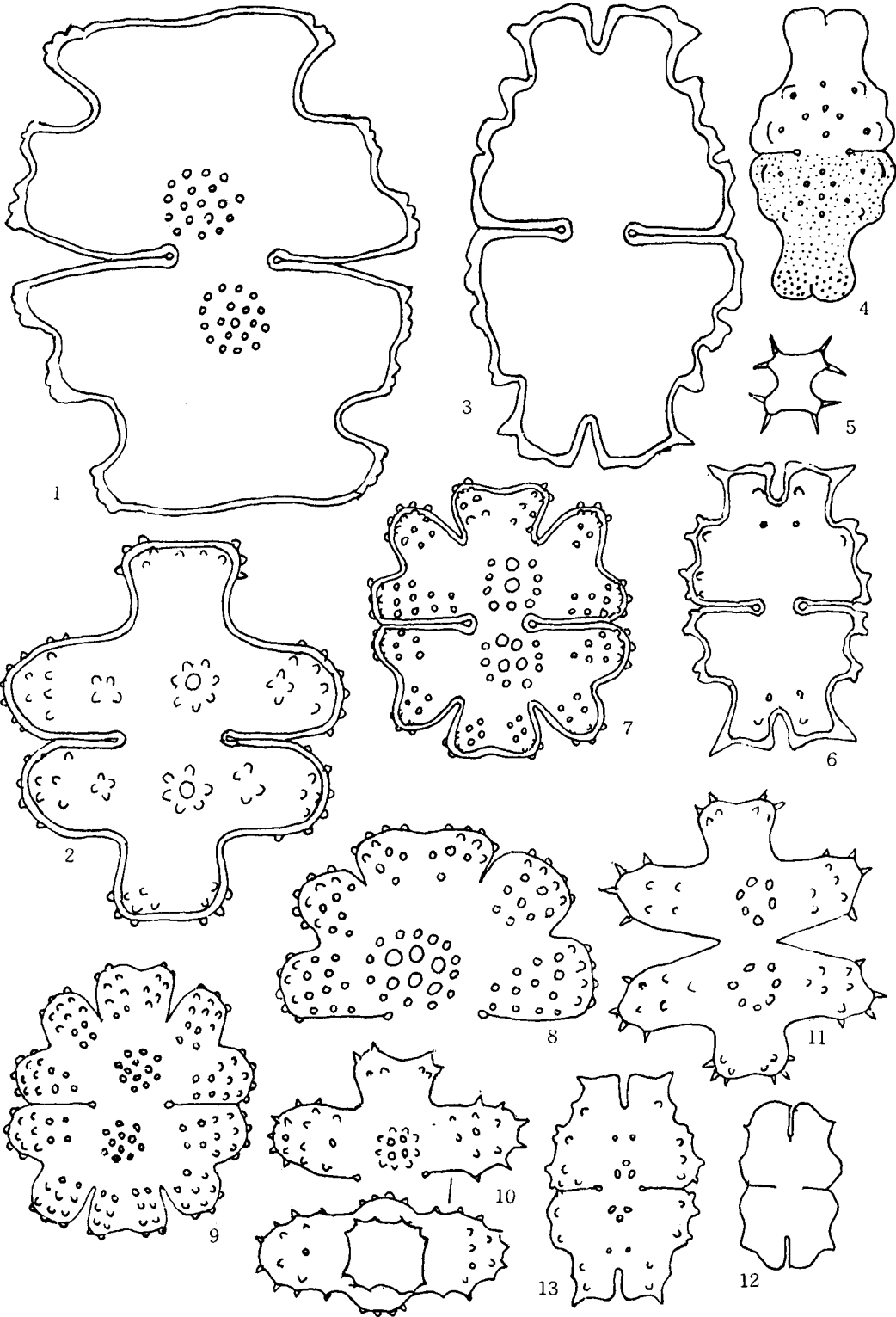
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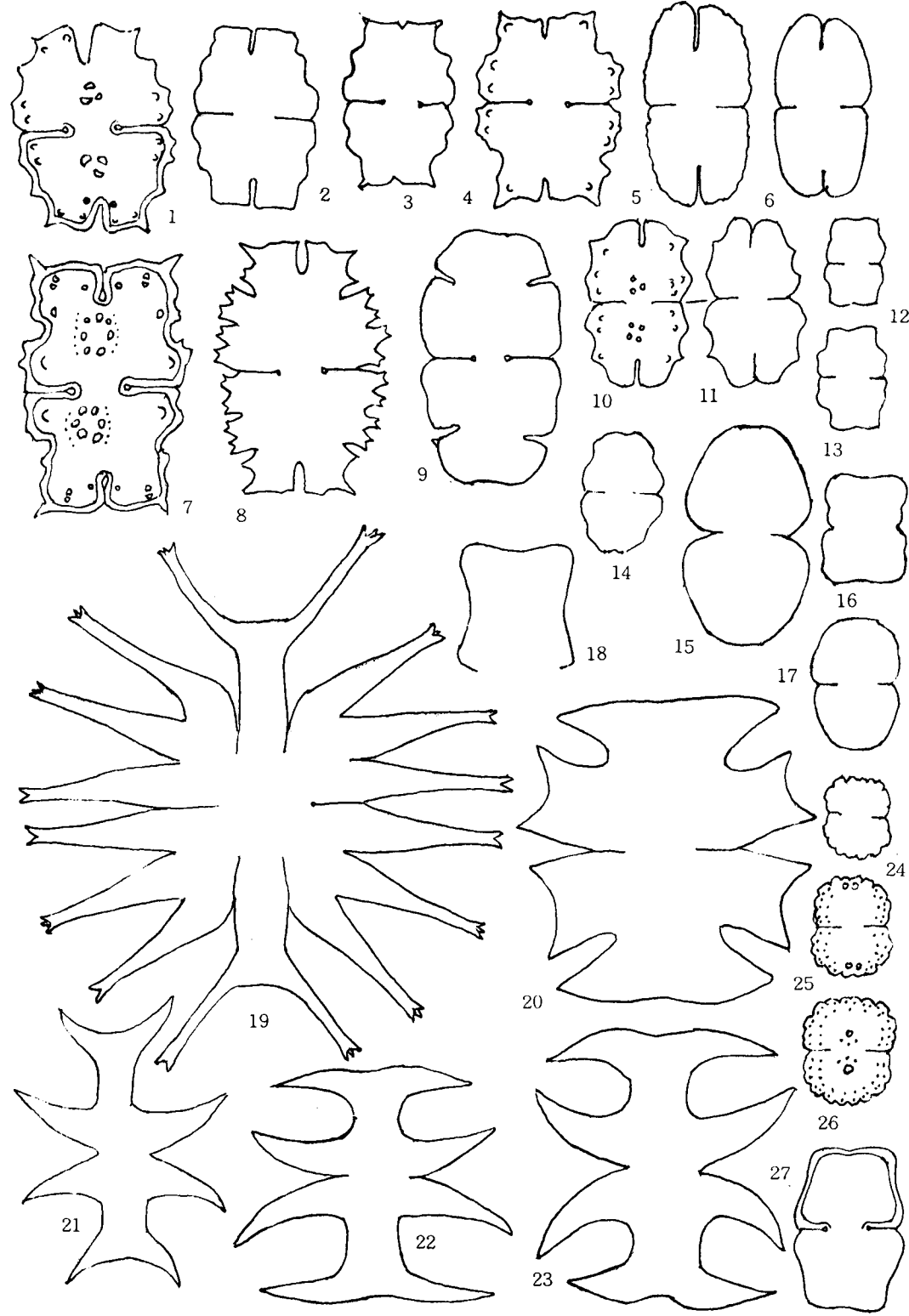
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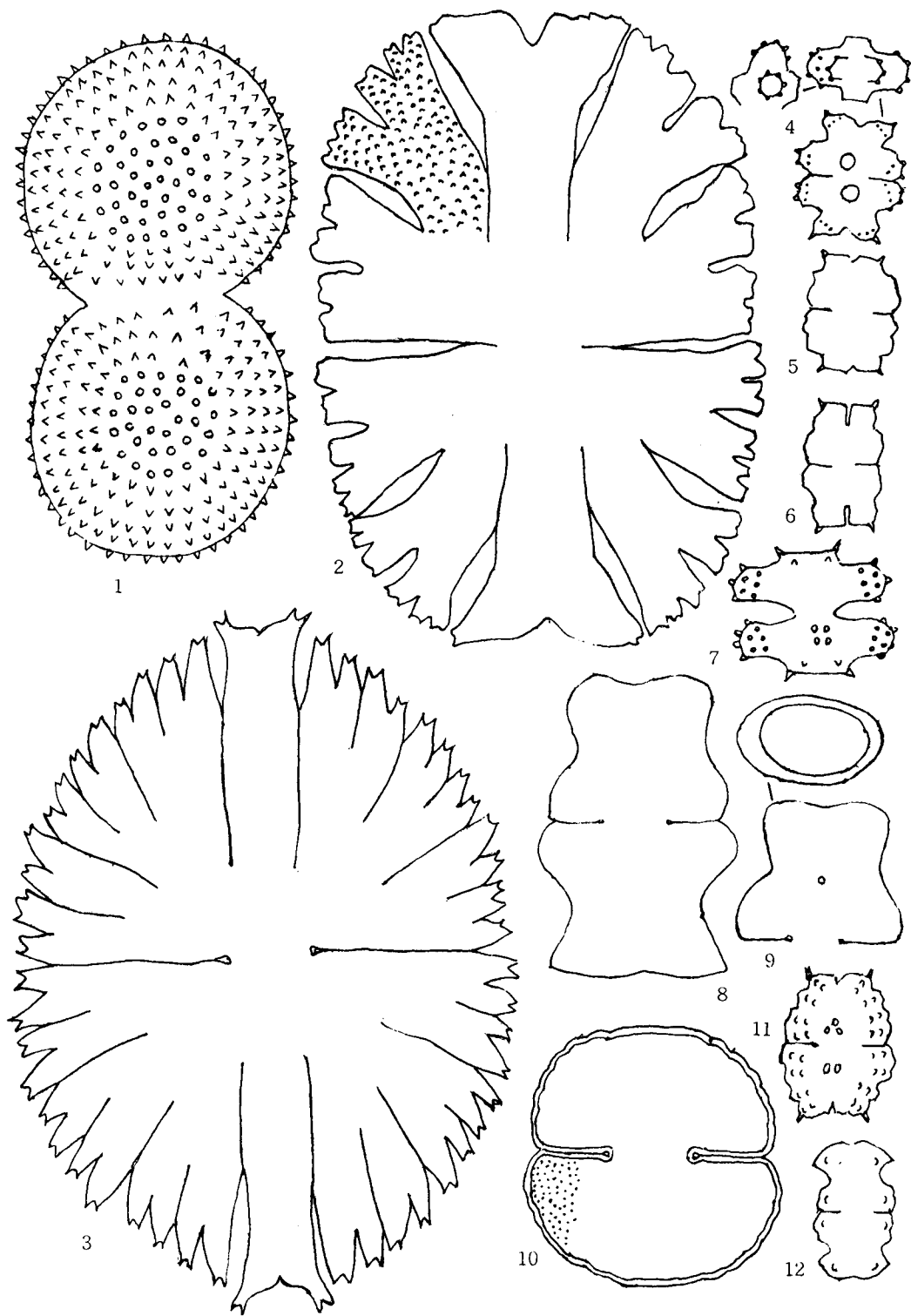
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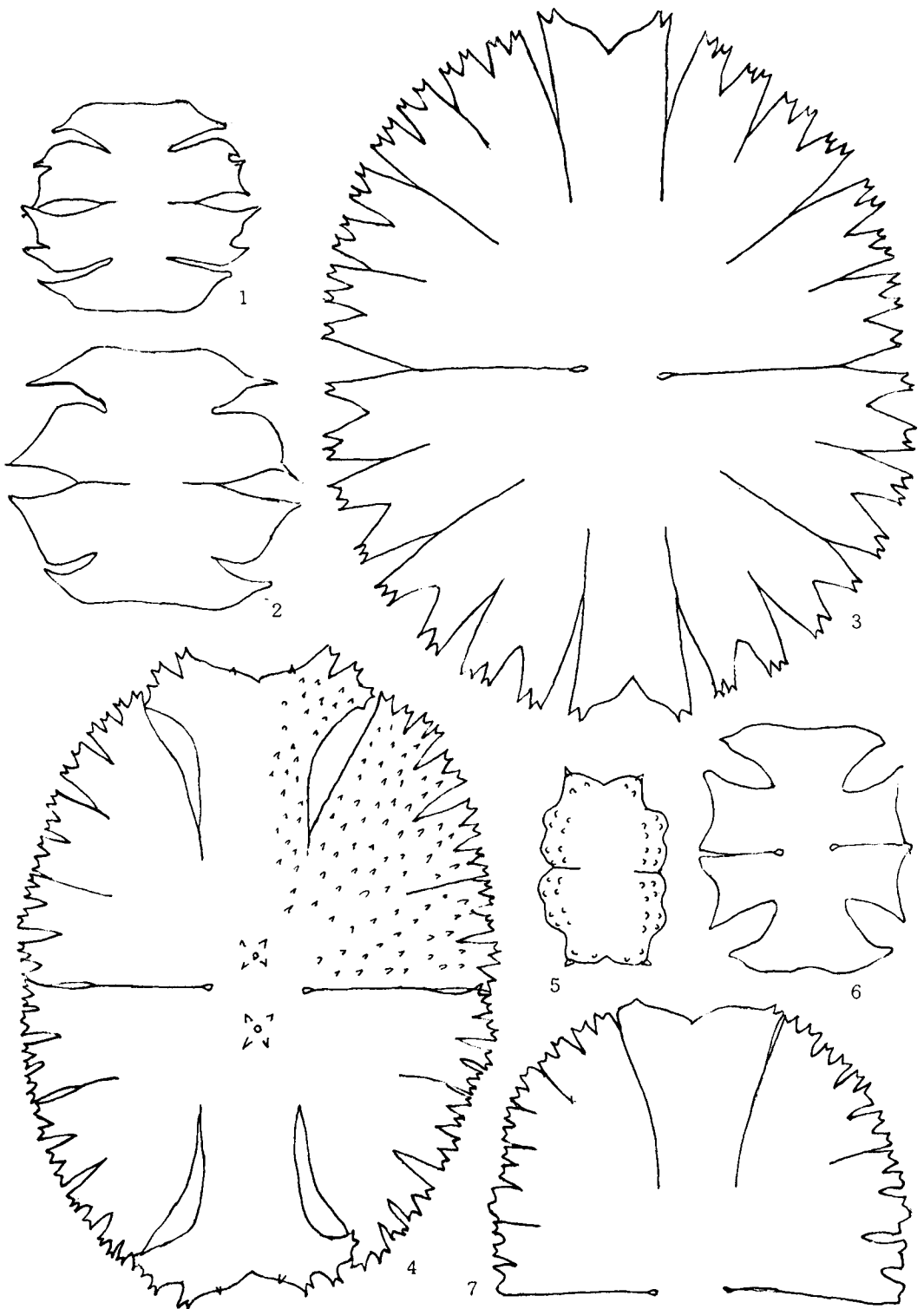
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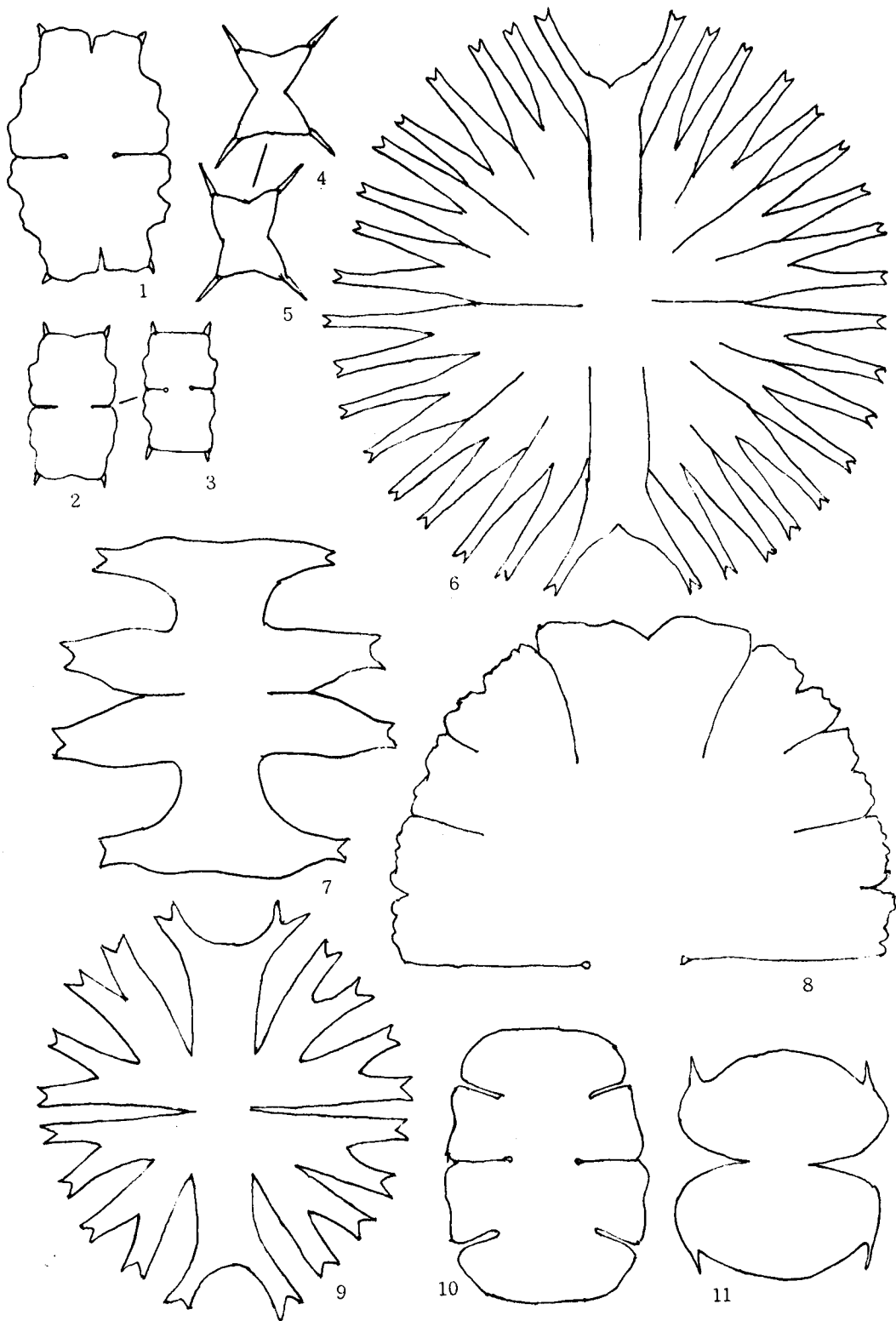


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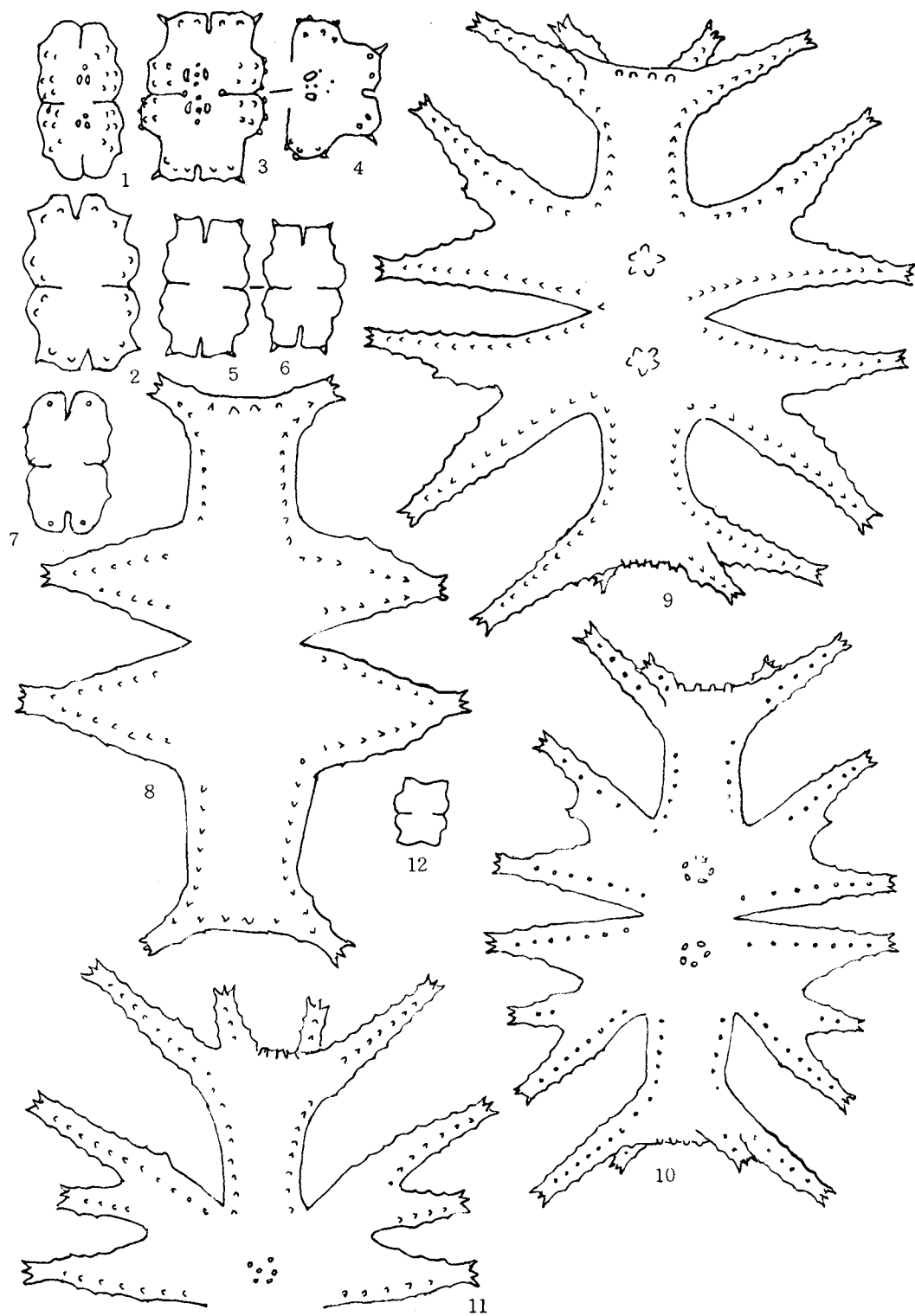


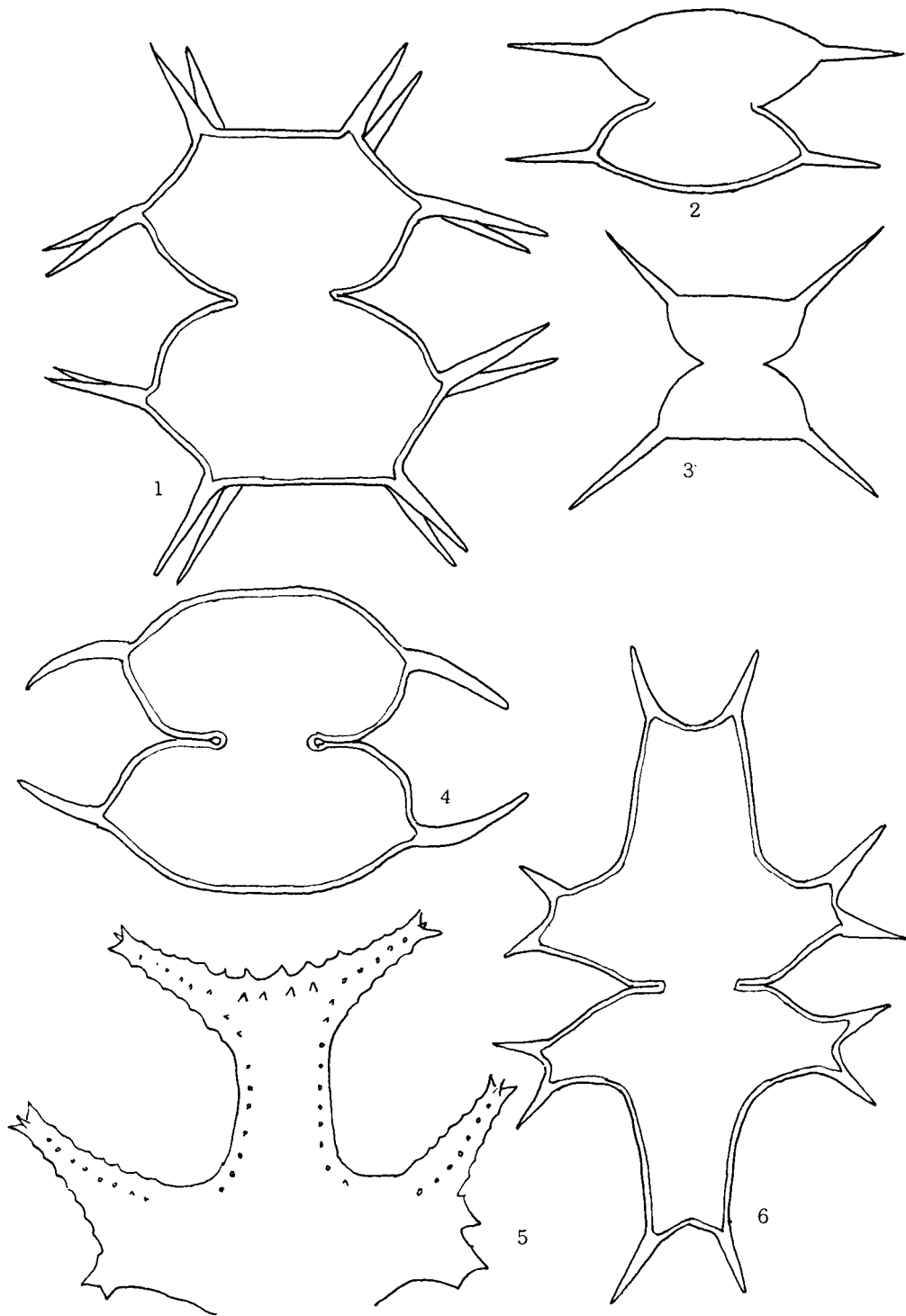
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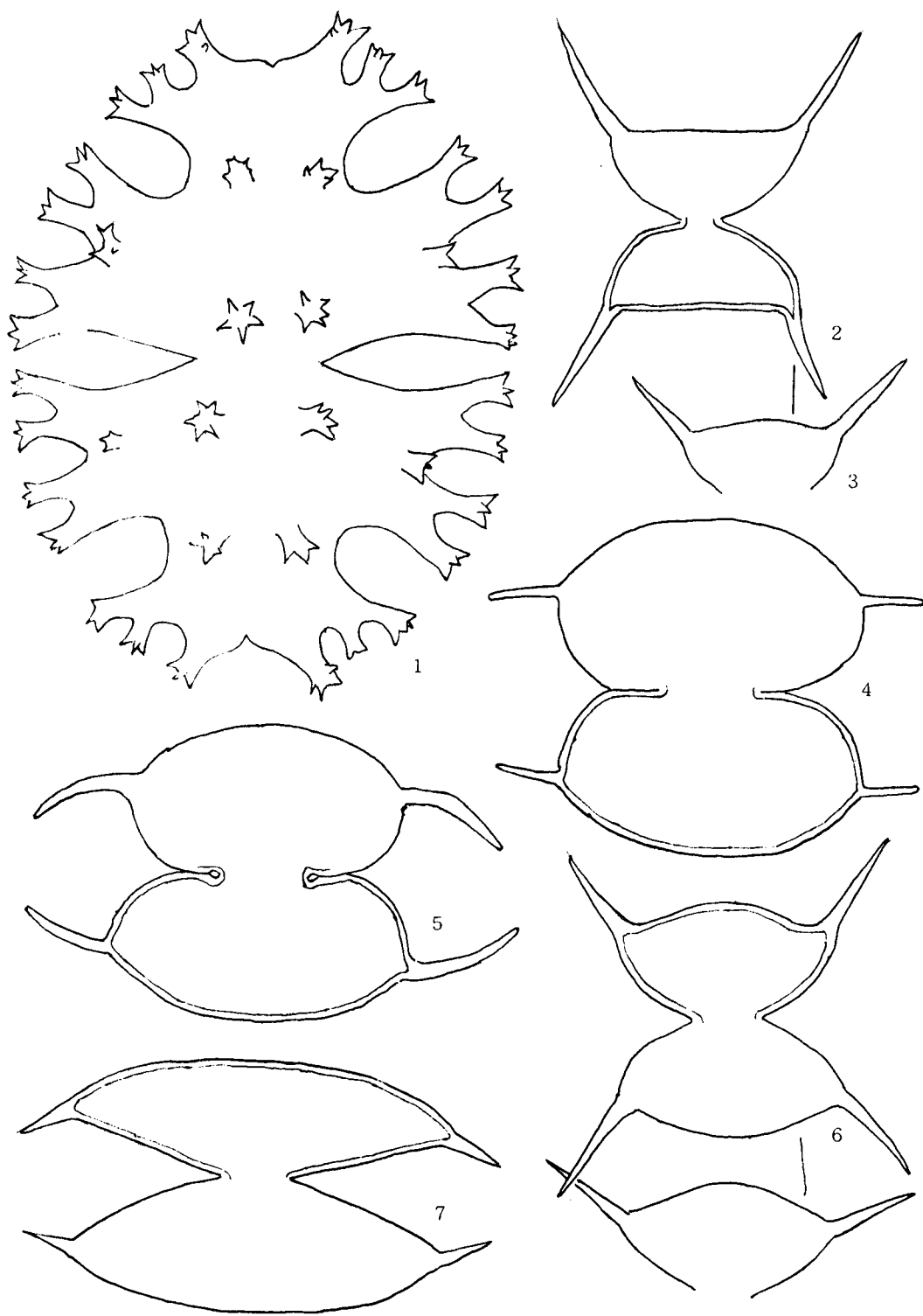


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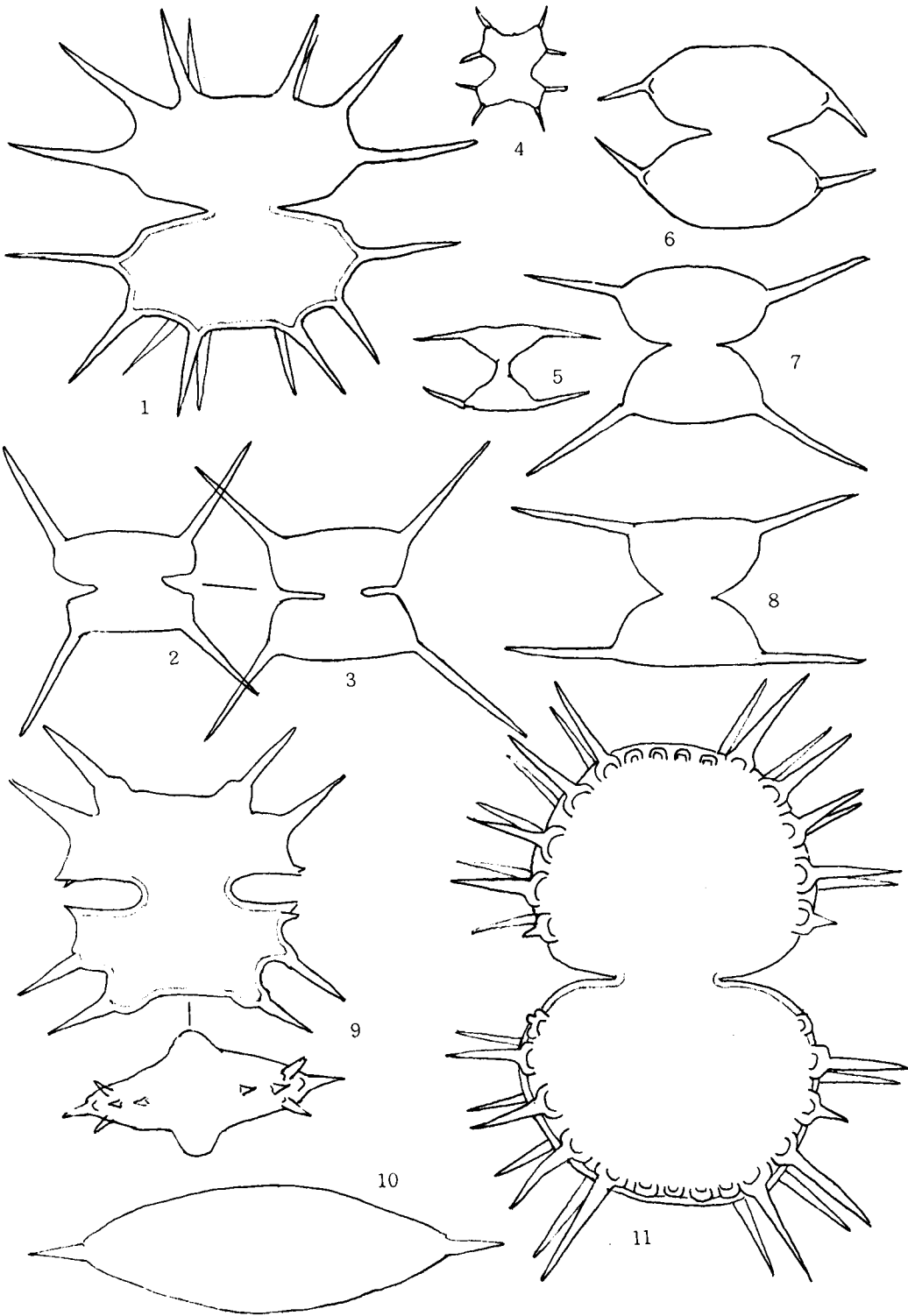




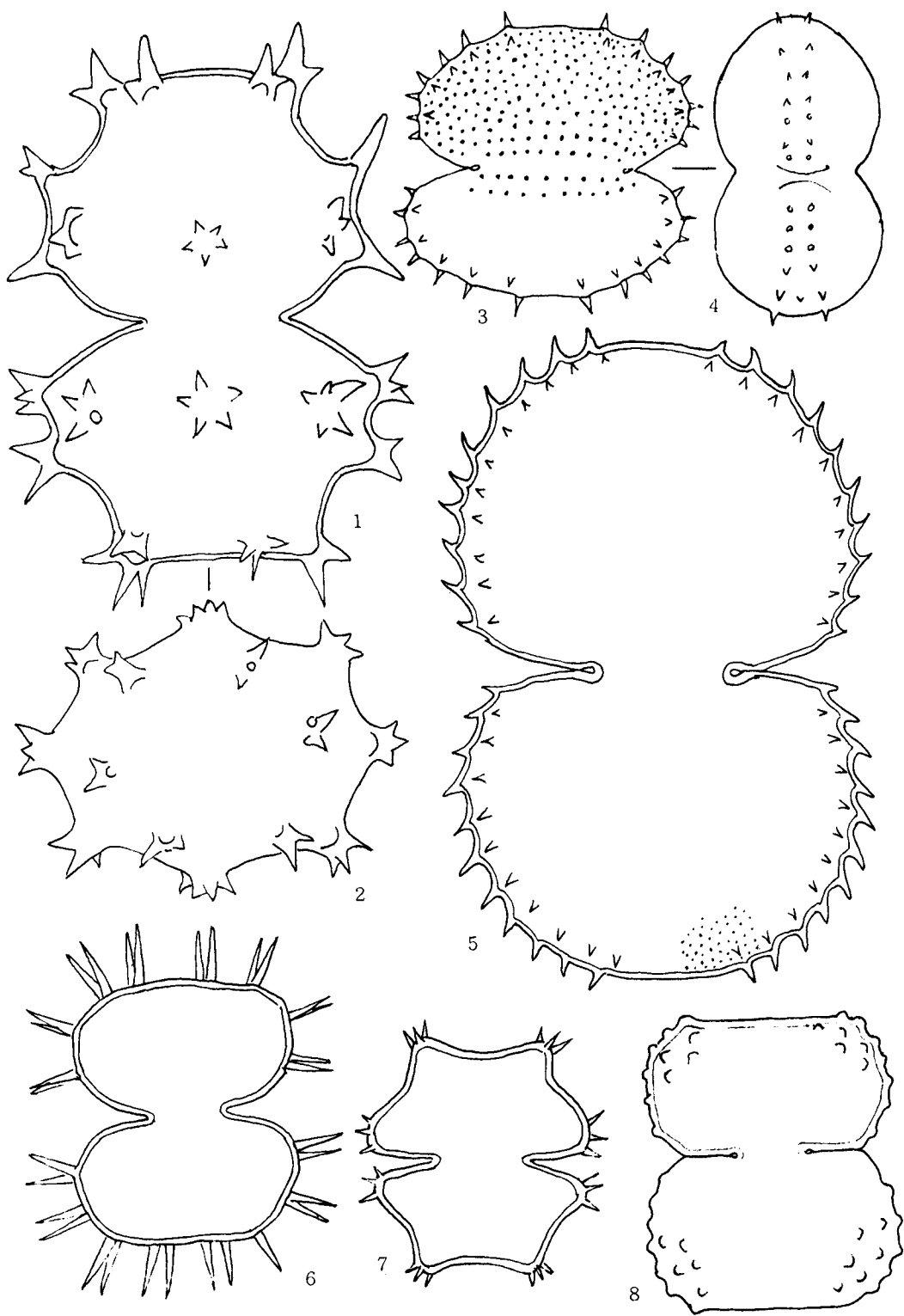
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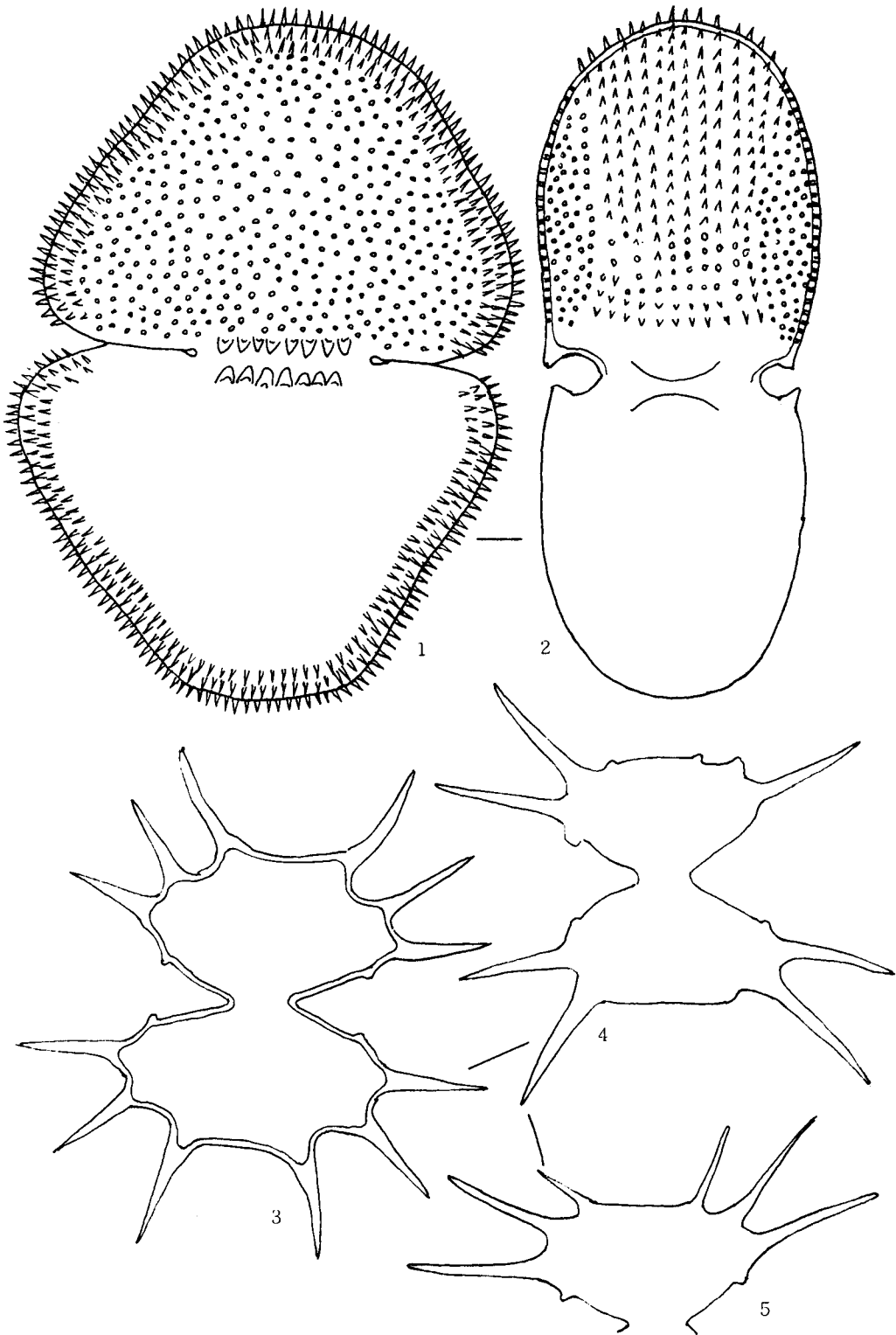
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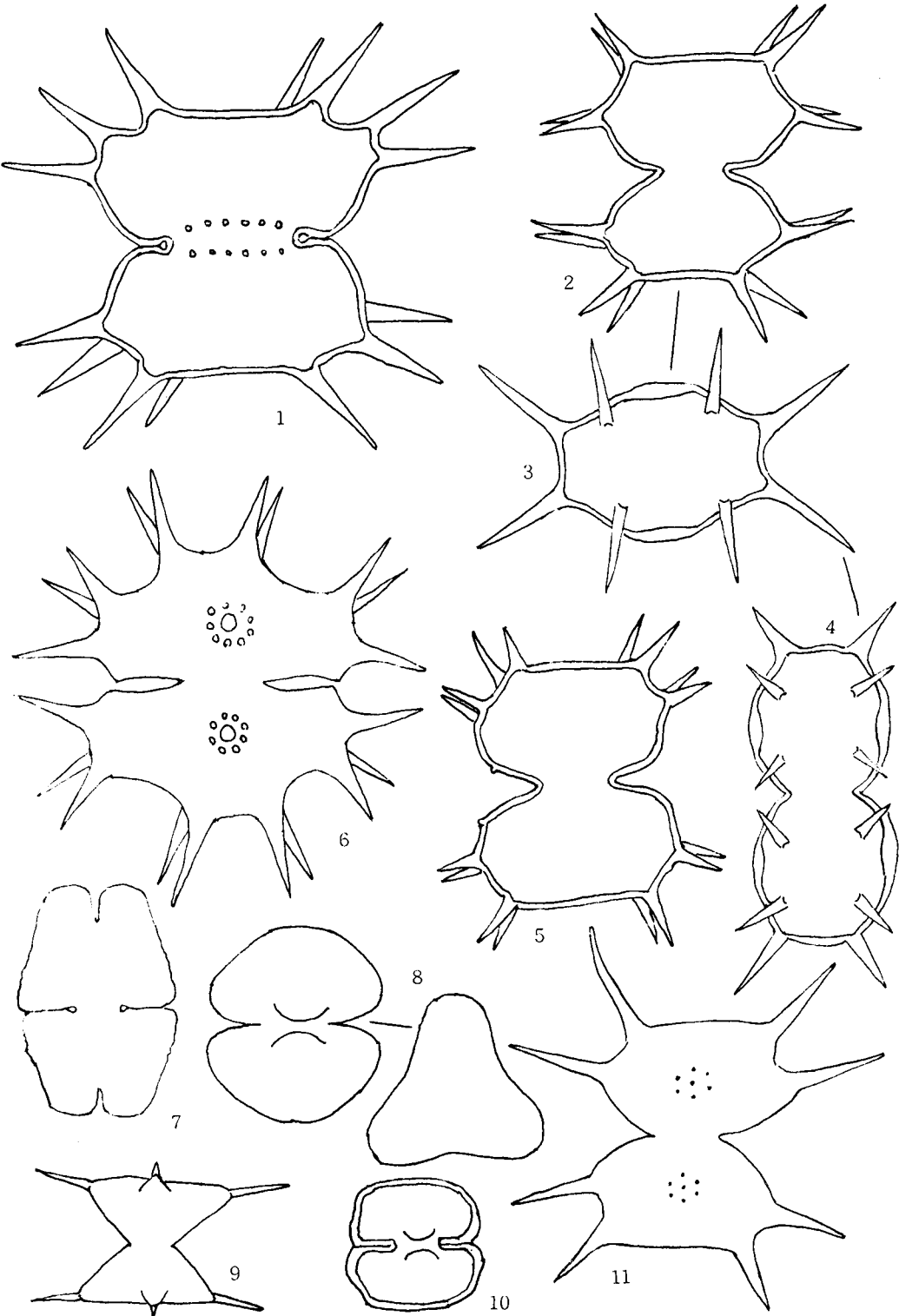
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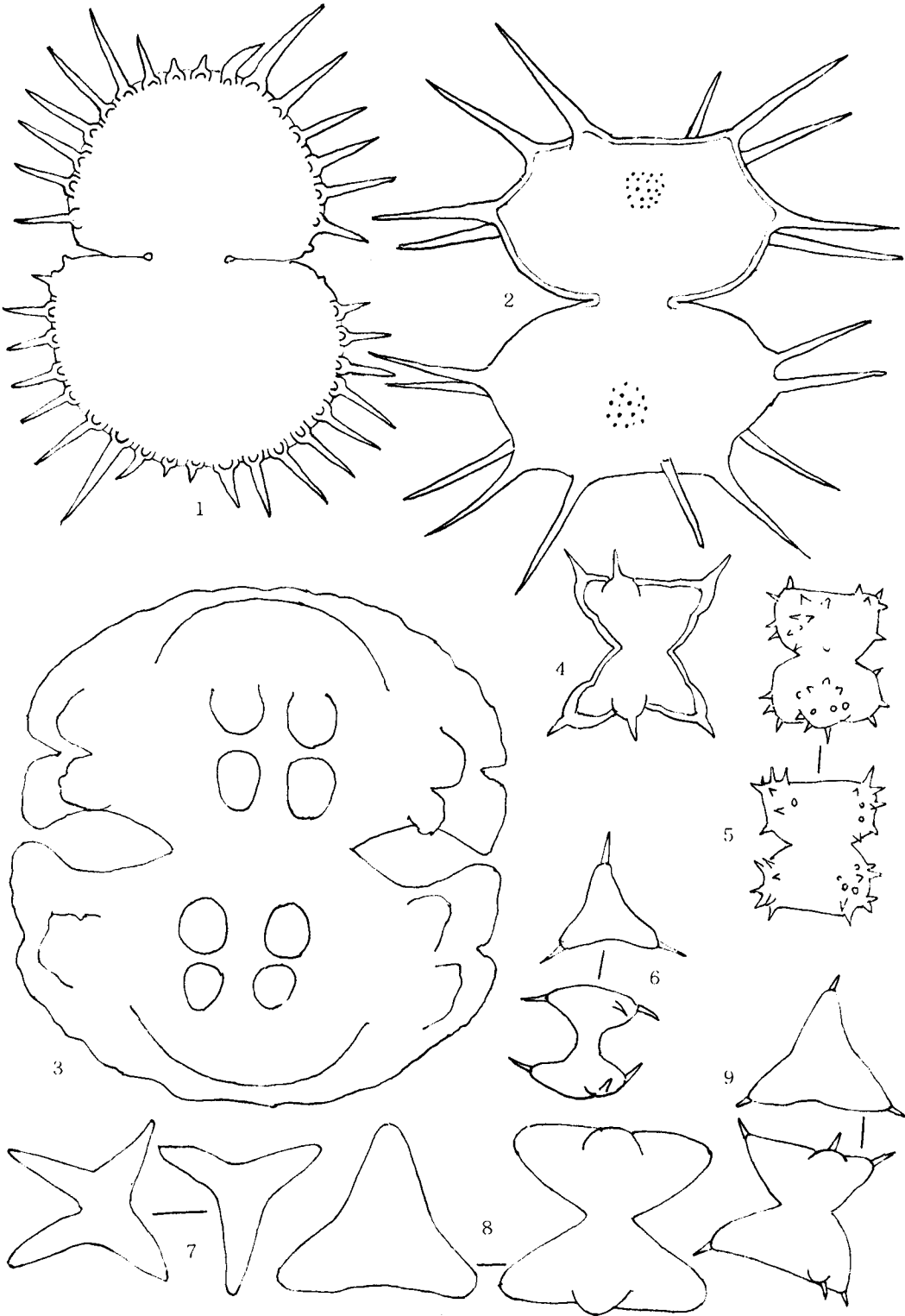
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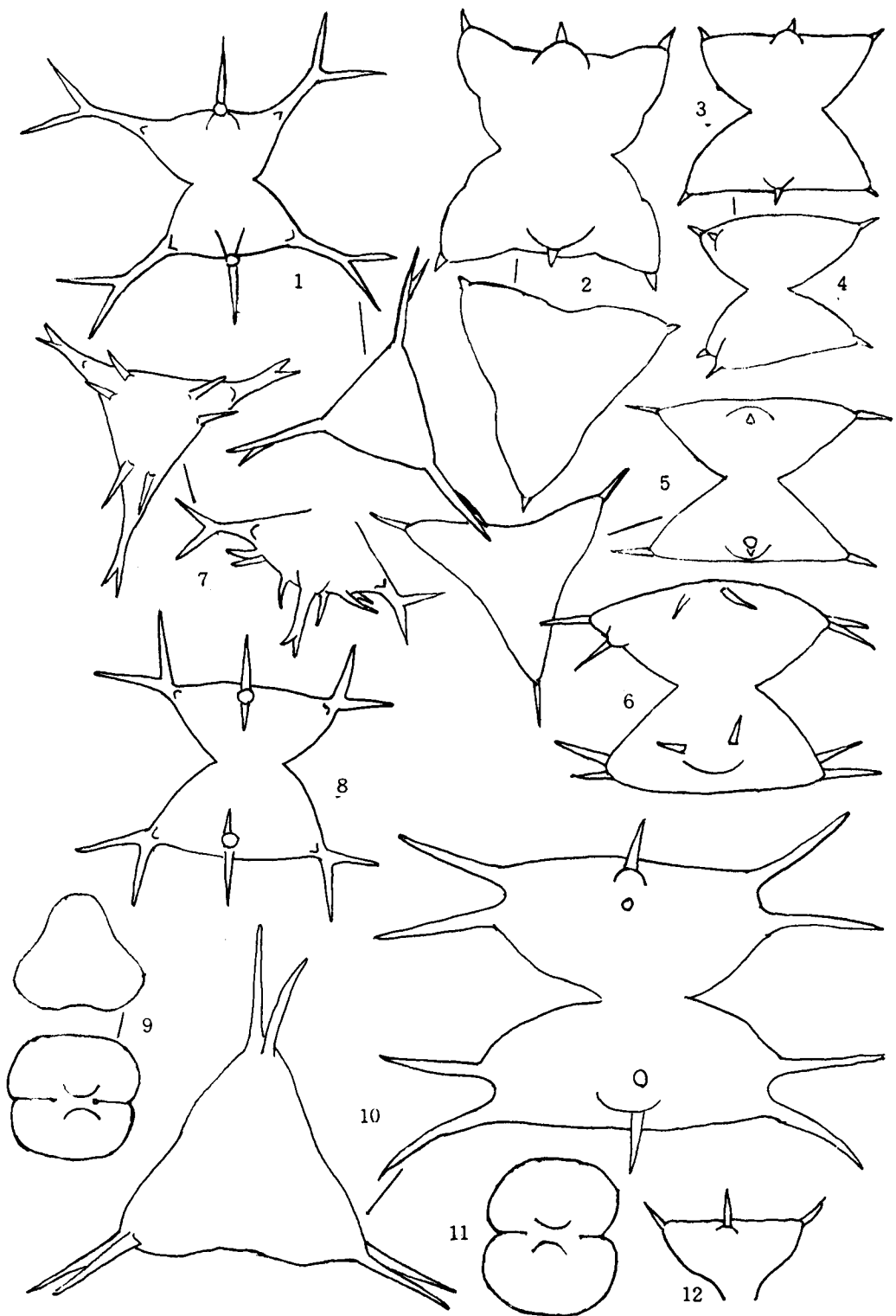
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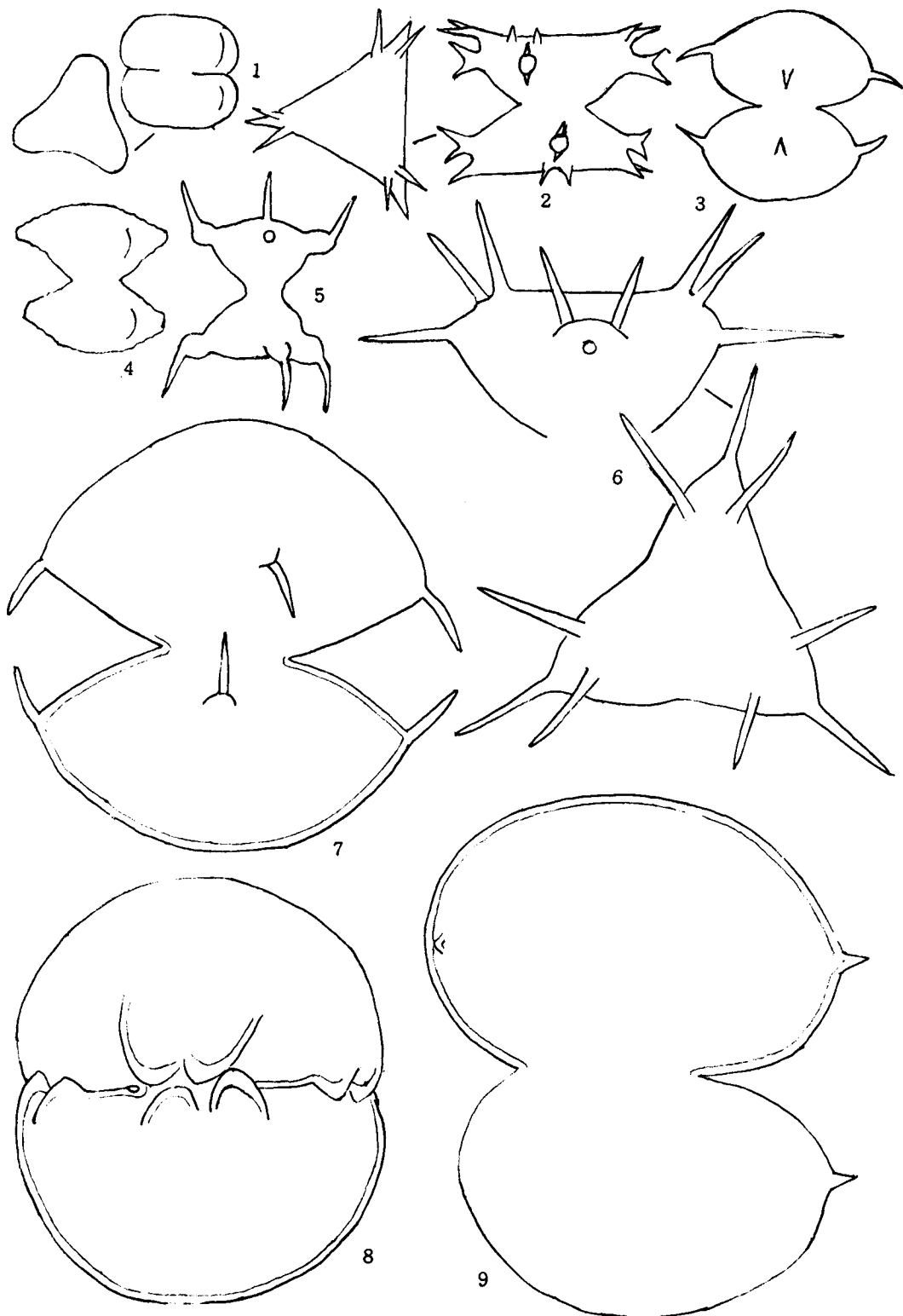


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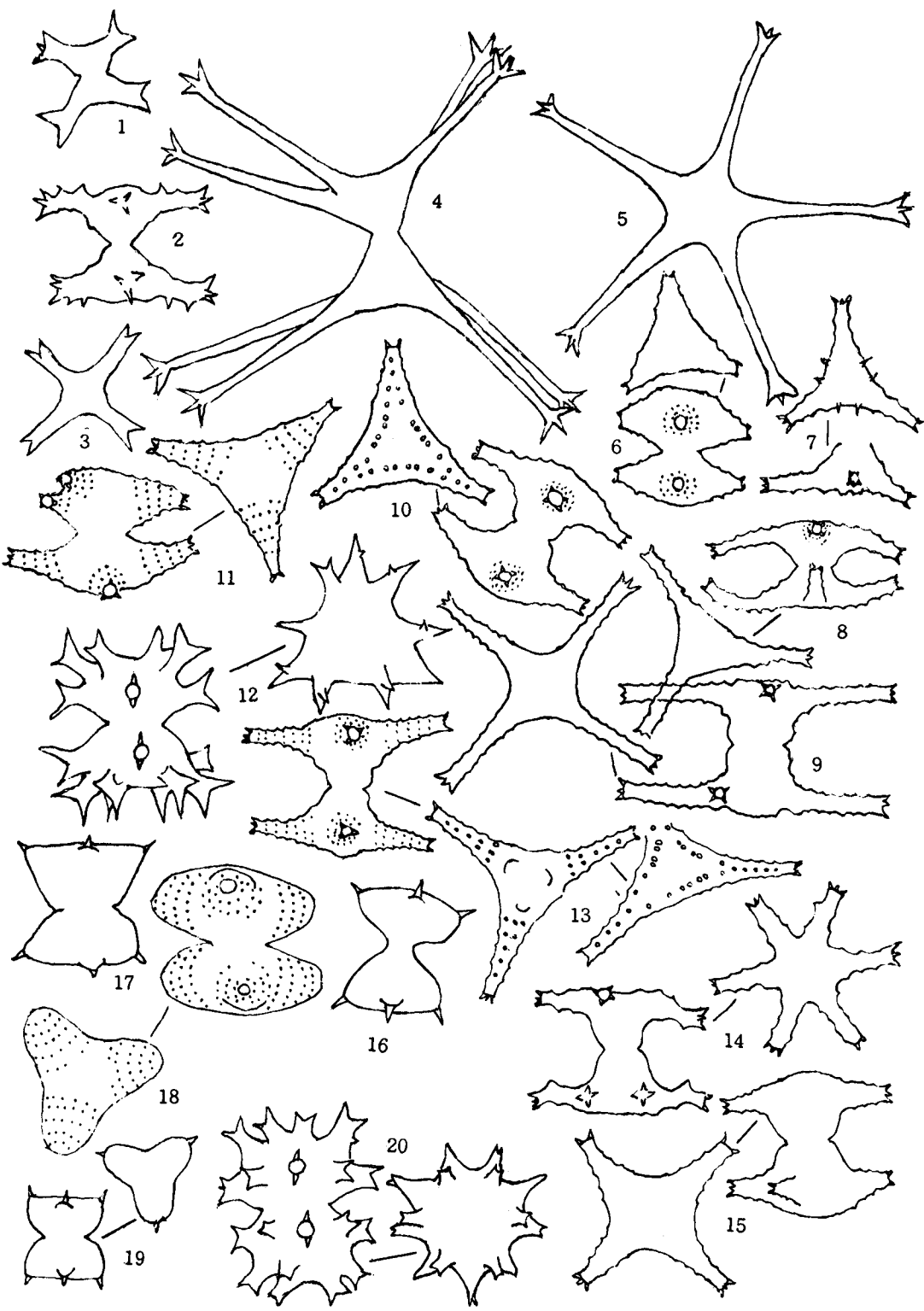


M. HIRANO: *Desmids from Thailand and Malaysia*

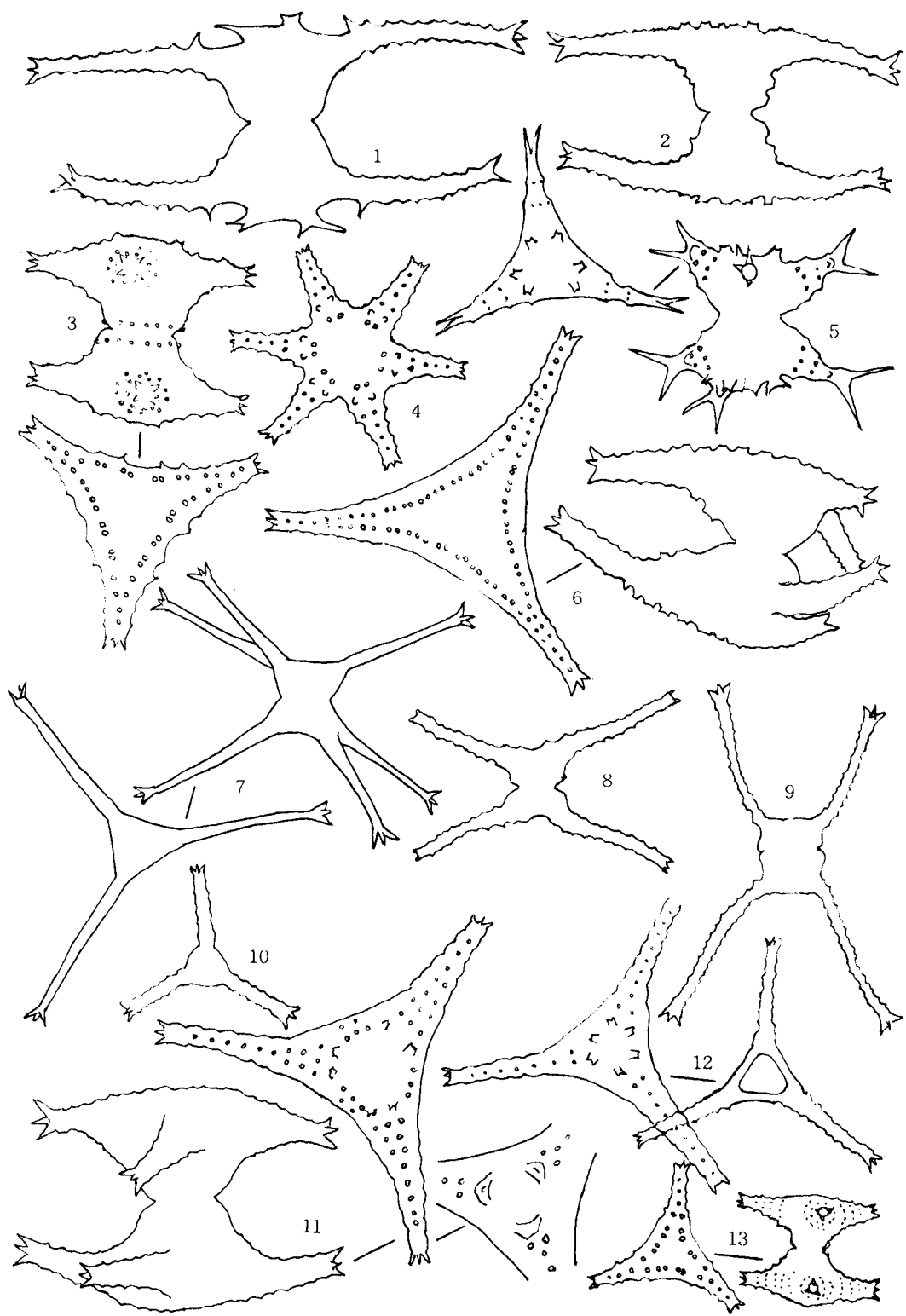




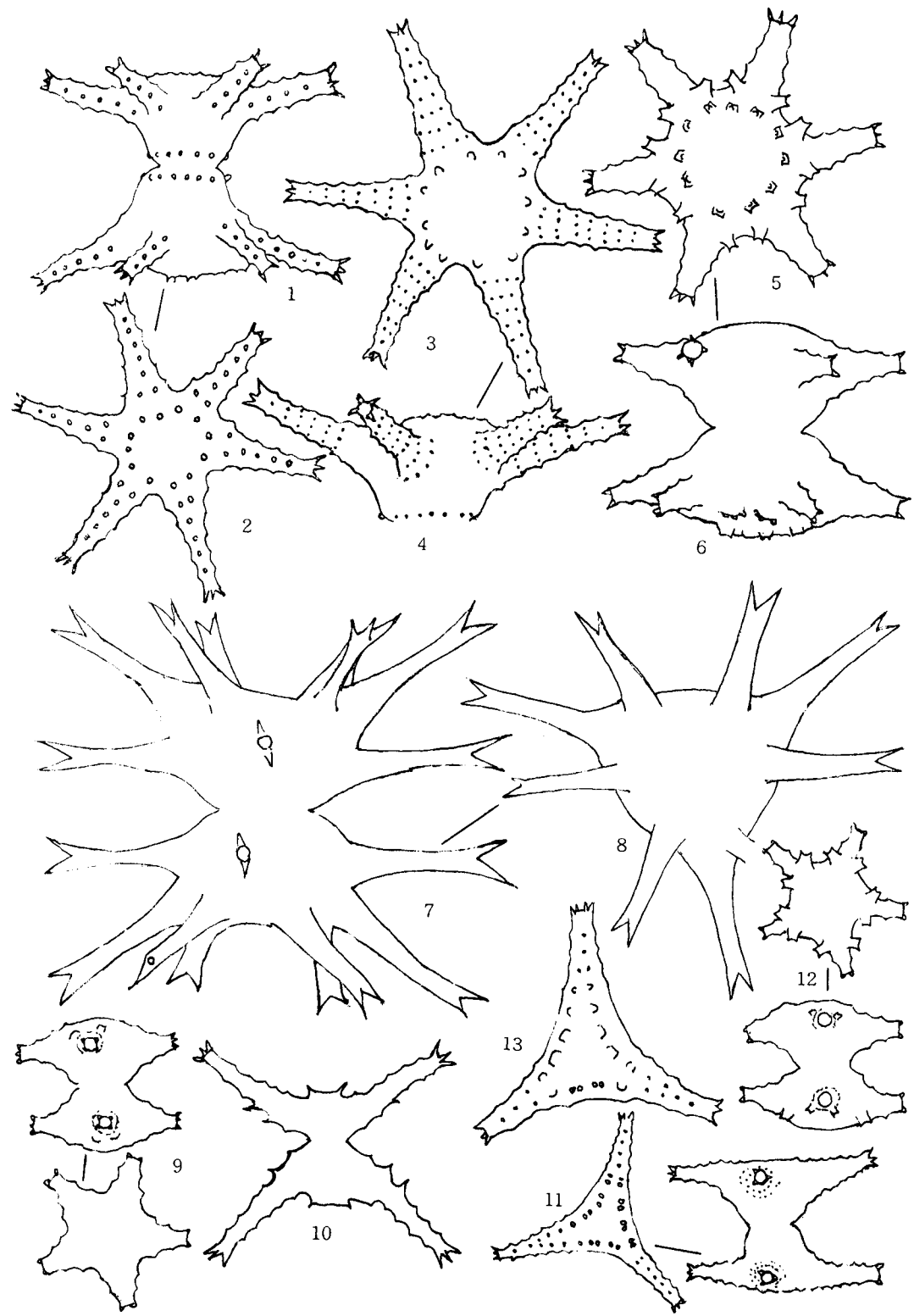
M. HIRANO: *Desmids from Thailand and Malaysia*



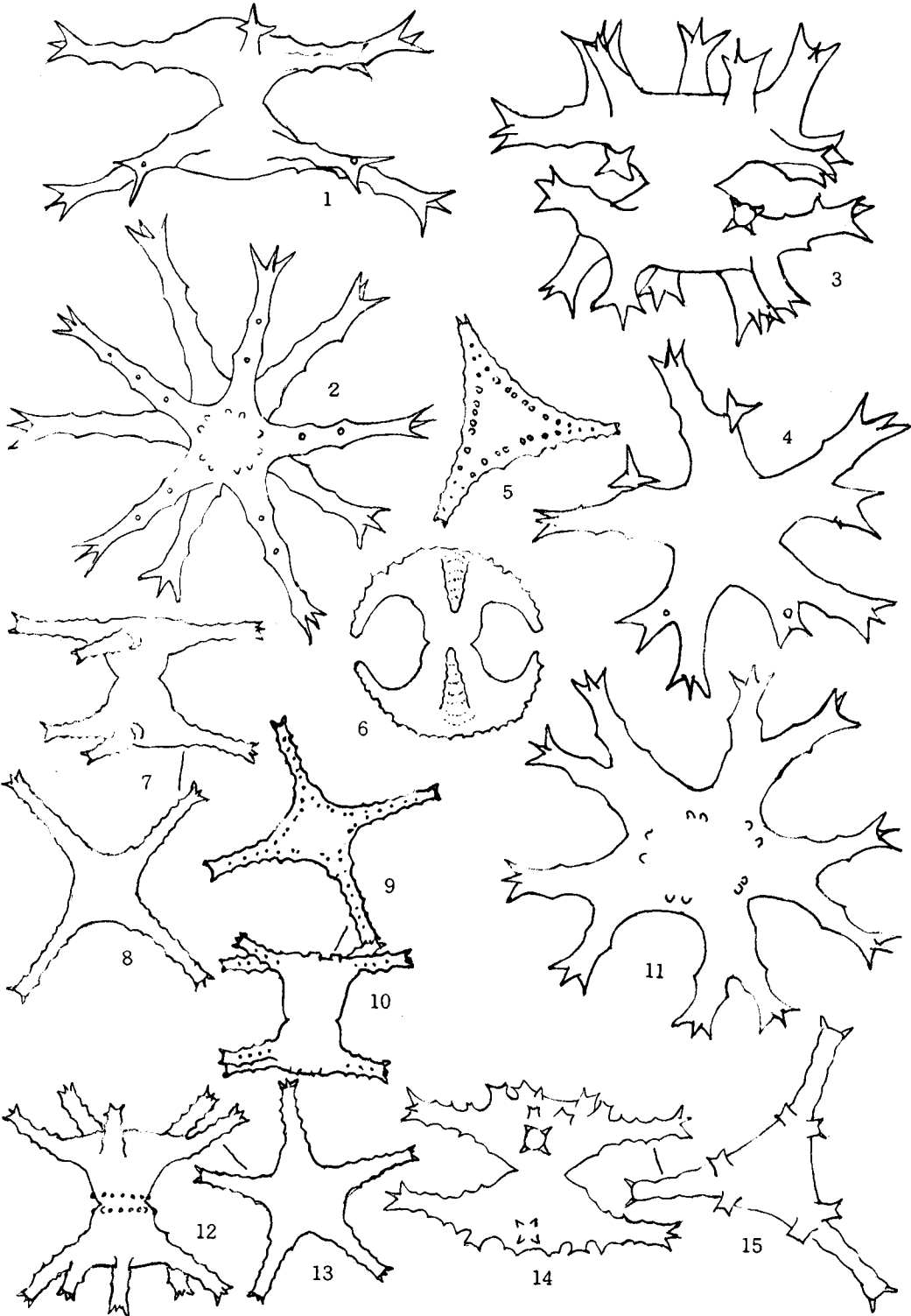
M. HIRANO: *Desmids from Thailand and Malaysia*



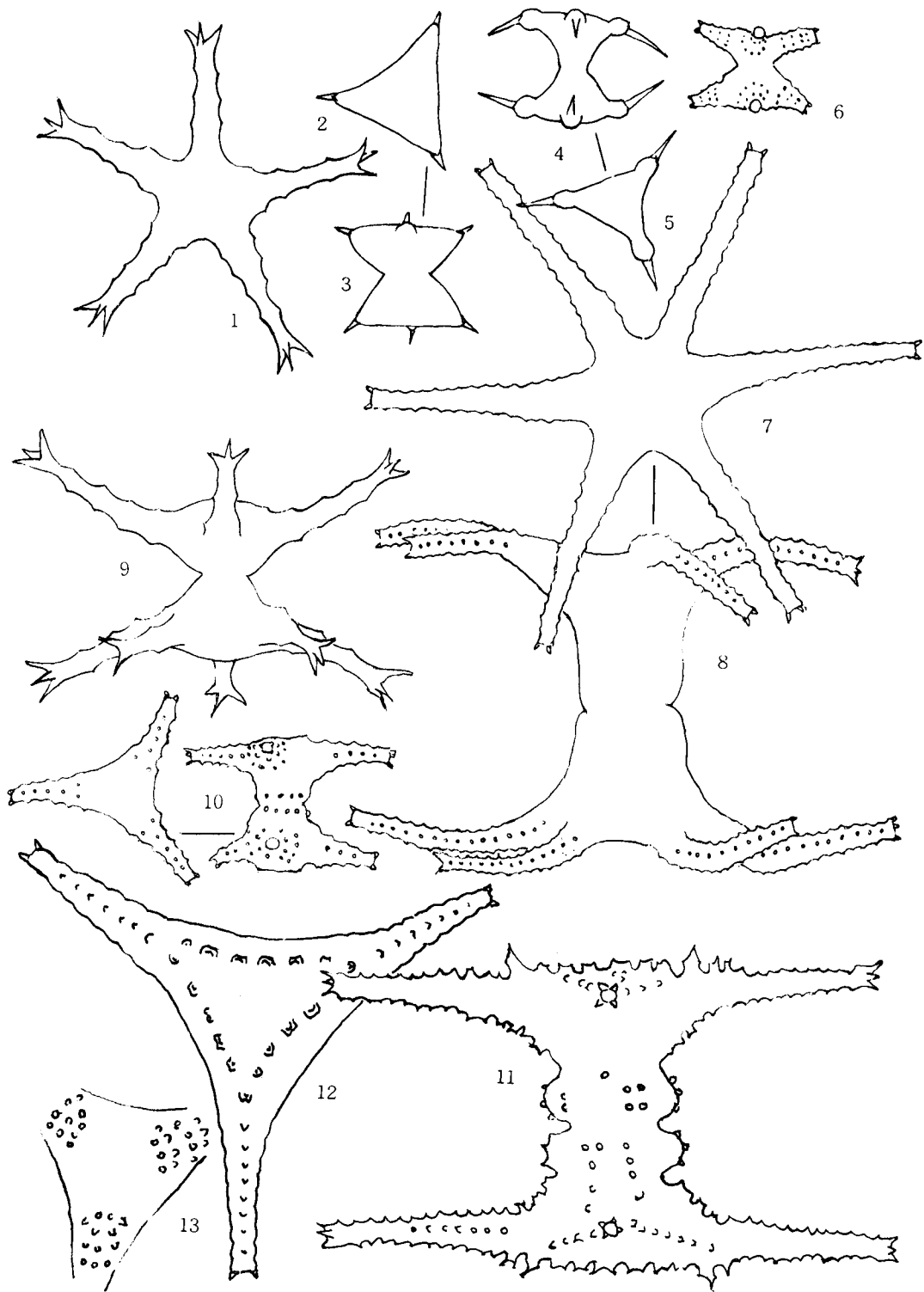
M. HIRANO: *Desmids from Thailand and Malaysia*



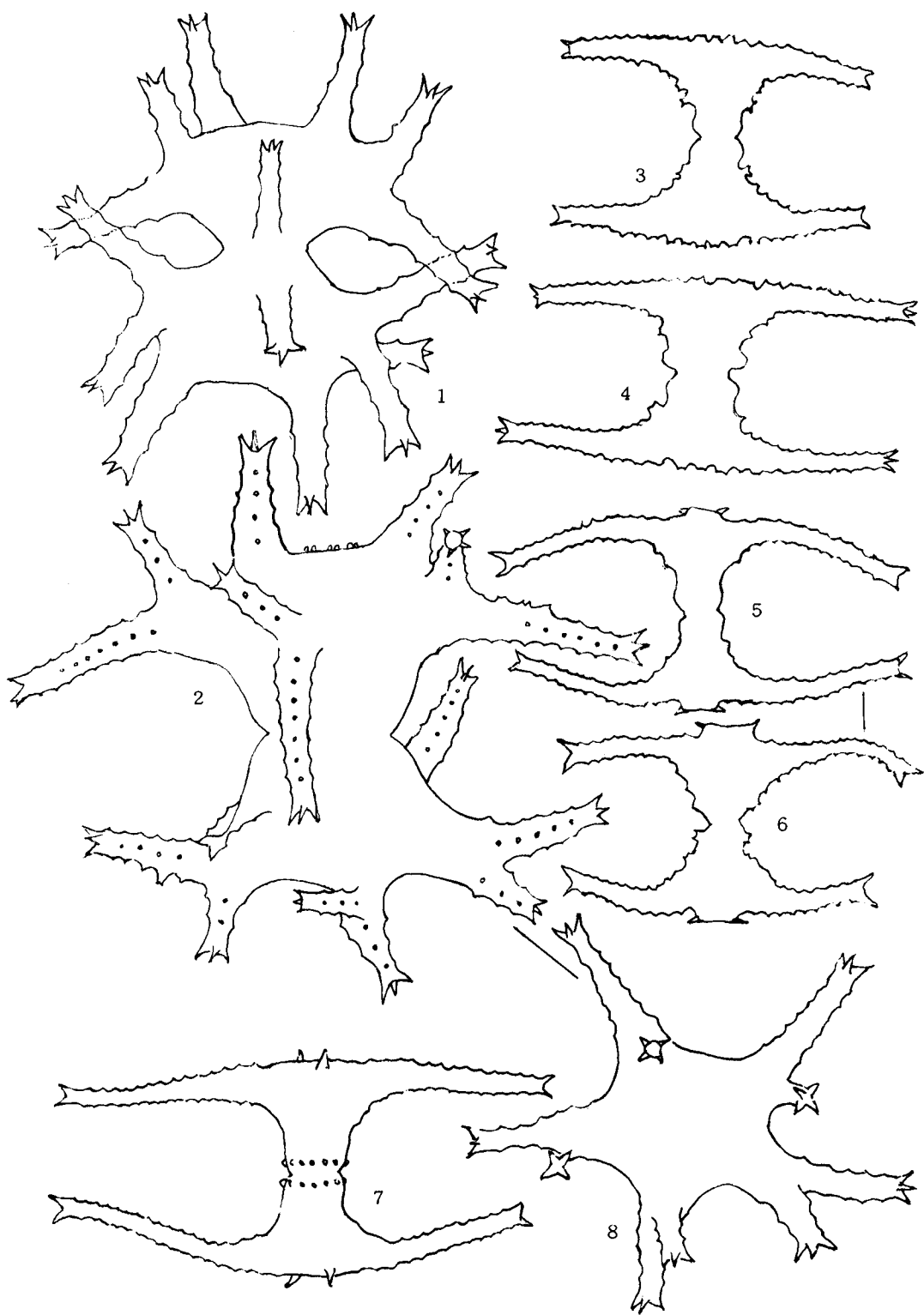
M. HIRANO: *Desmids from Thailand and Malaysia*



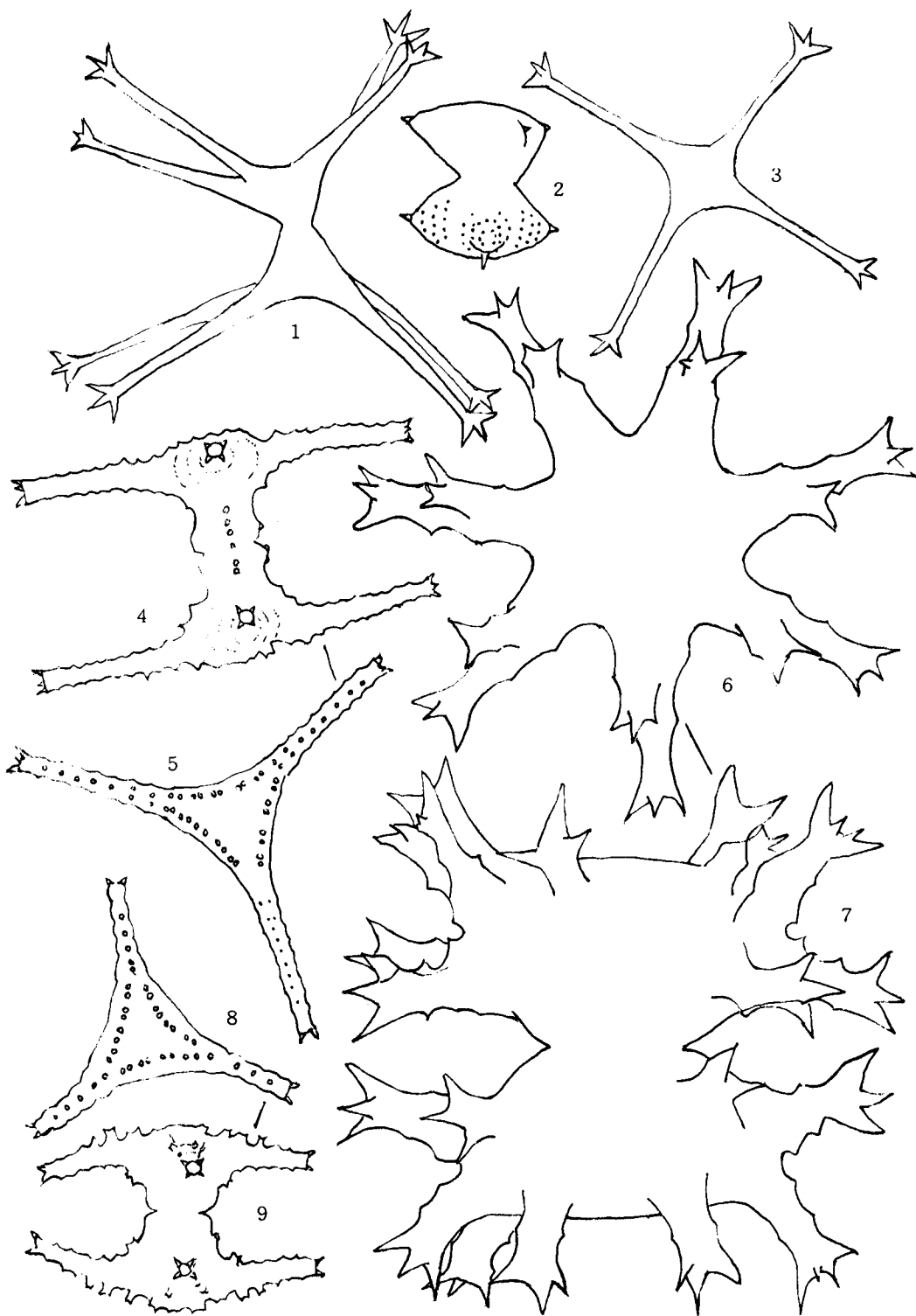
M. HIRANO: *Desmids from Thailand and Malaysia*



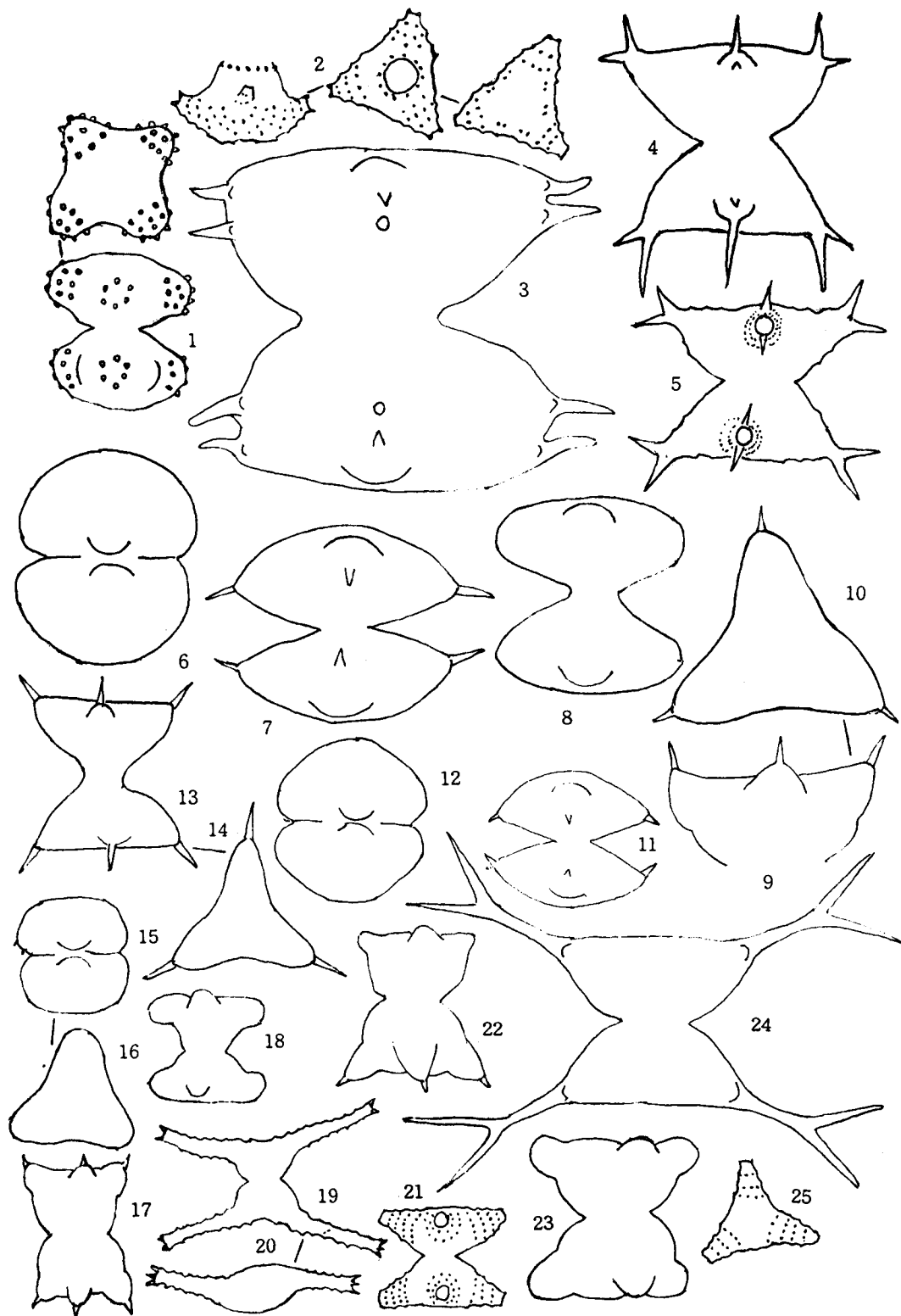
M. HIRANO: *Desmids from Thailand and Malaysia*



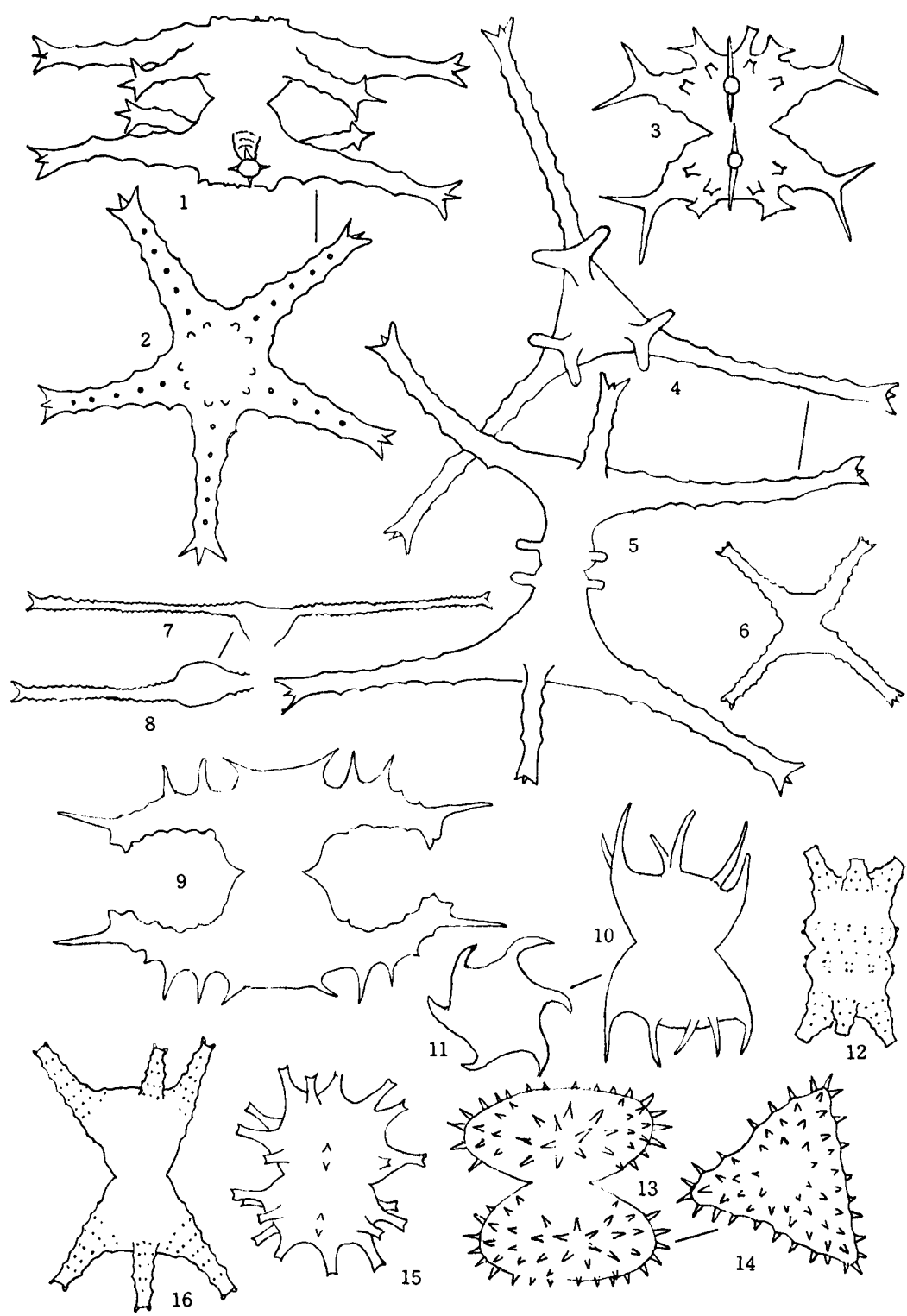
M. HIRANO: *Desmids from Thailand and Malaysia*



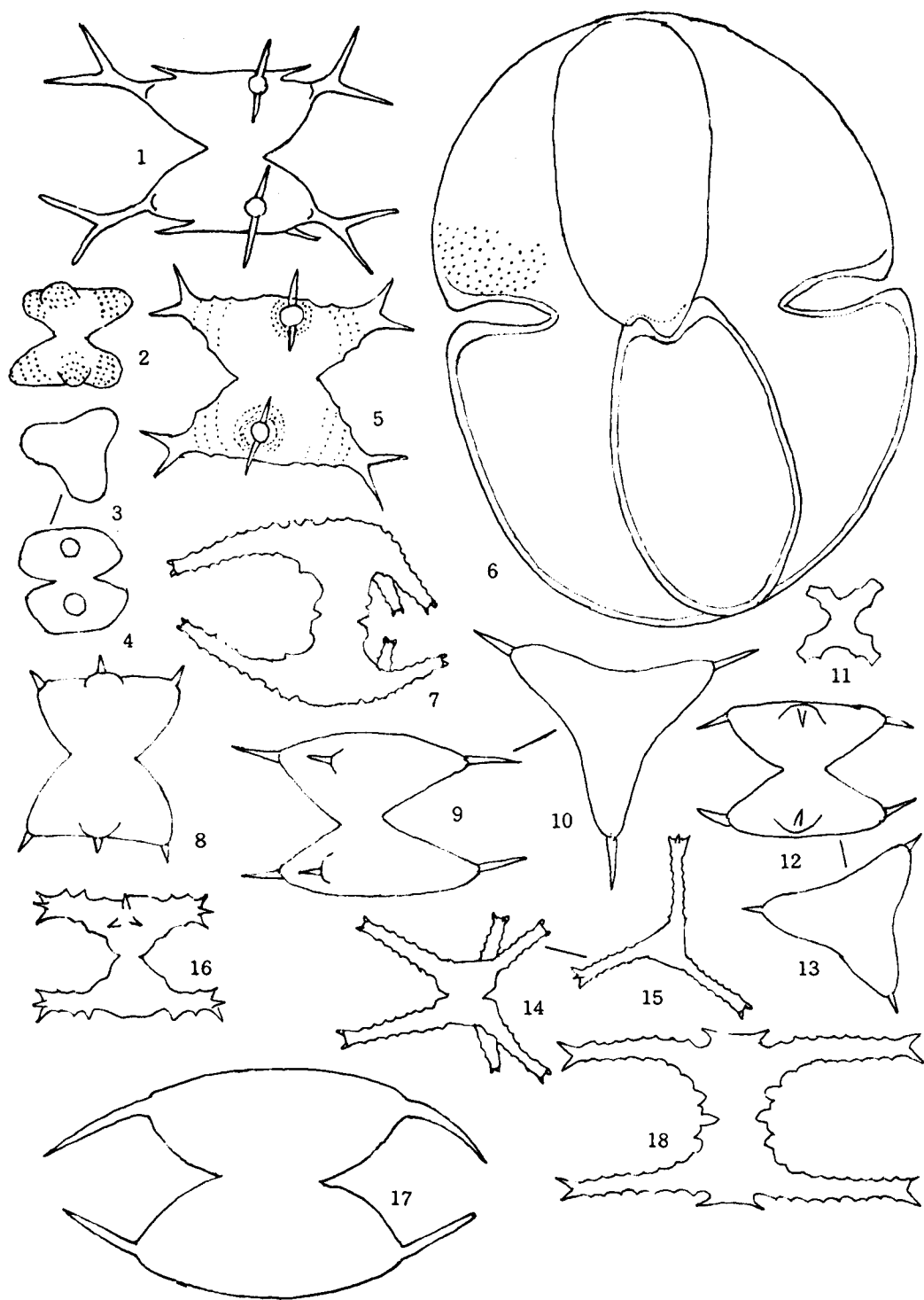
M. HIRANO: *Desmids from Thailand and Malaysia*



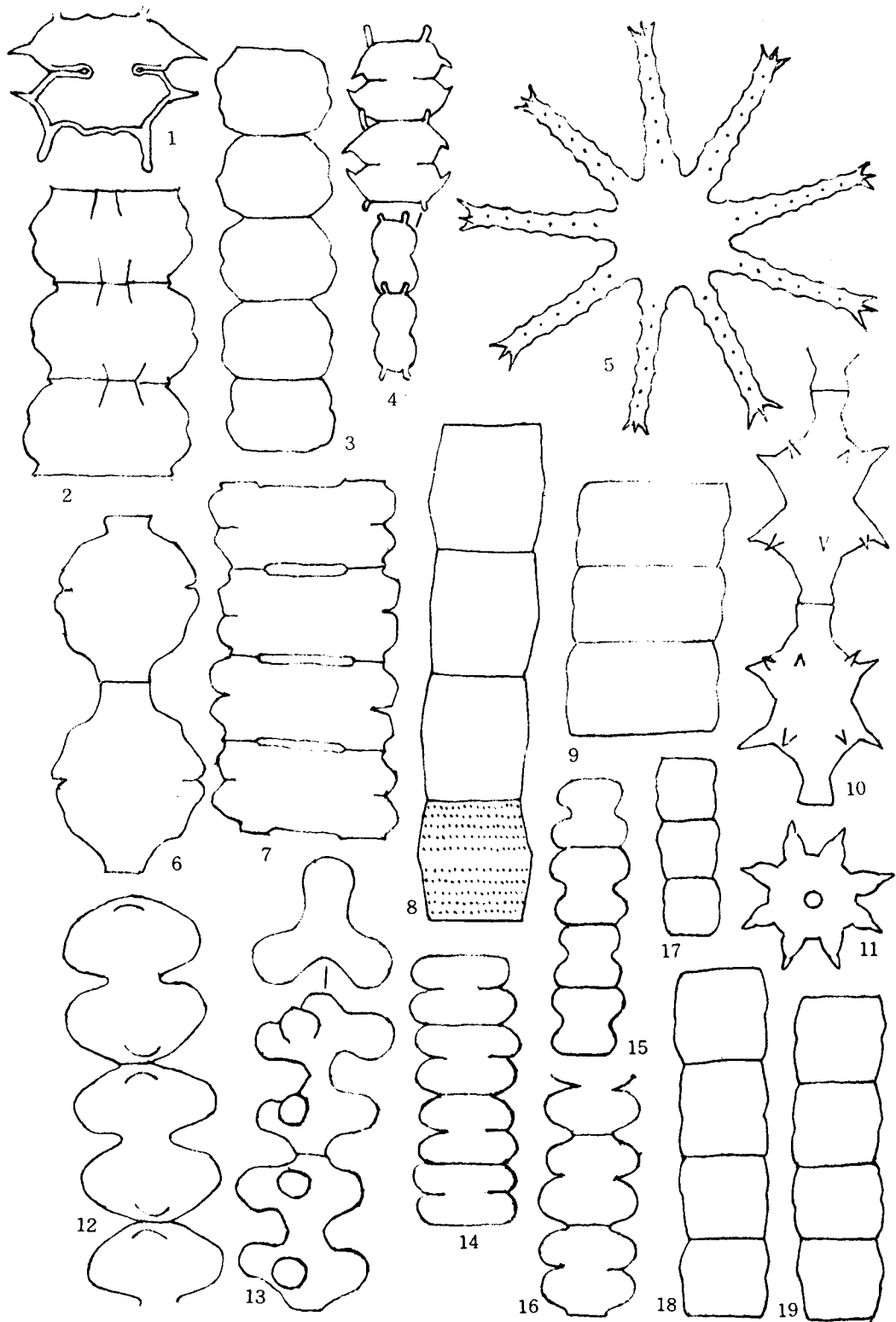
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